

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

DEC. 19, 1955

50 CENTS

VERSATILITY...



Commercial Airliner



Flying Hospital Ship



Cargo Plane



Executive's Flying Office



Electronic Test Plane



Military Transport



Turboprop Transport



Navigator-Bombardier Flying Classroom

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When the nacelle temperature rises above maximum normal, the control unit recognizes "potential trouble," and triggers an ABNORMAL TEMPERATURE signal.

However, if there is a sudden flash of fire in the nacelle, the control unit interprets the rapid rise

in temperature as a definite danger condition, and a FIRE ALARM is actuated. The pilot then operates the nacelle fire extinguishing system to put out the blaze.

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Lightweight and compact, the Kidde Aircraft Fire Detector can be adapted to meet the needs of all aircraft produced today. For more information, write Kidde now.

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FACTS

about

NEW DEPARTURE STEEL BALLS

**Available in any quantity
to fit your specifications
for grade, size and accuracy!**

When industry wants steel balls of proven accuracy and dependability, it is only natural that they turn to New Departure, leading producers of ball bearings and therefore thoroughly experienced in the manufacture of precision balls. Today, New Departure provides industry with high-carbon chrome and stainless steel balls in a wide range of sizes and specifications.

New Departure balls are produced from the finest high-carbon chrome steel, AISI Type E52100 steel, specially made for New Departure, in heat-treated to achieve the proper hardness and toughness for maximum strength and life in the finished product. Stainless steel, AISI Type 440C, used by New Departure results in balls of much improved corrosion and load-carrying ability.

In addition to producing the finest steel balls available, New Departure will fill volume orders for balls of special materials such as high-radiol or cobalt-base alloys, tool steel and others.

NEW DEPARTURE • DIVISION OF CORNELL ROTARY • BRIDGE, CONN.

New Departure steel balls are produced in a wide range of sizes. The illustration shows about 2,000 balls one sixteenth of an inch diameter. There is enough steel in the large ball to make 125,000 of the tiny balls.



Steel ball size is shown through glass to permit better detail and location.



Positive control of grain flow is obtained with New Departure ball-making technique.



Balls are heat-treated, quenched in oil or water, then tempered to desired hardness.



These precision steel balls are being examined by computer-driven test.

*Applications range from power steering to pencils



The unique advantages of New Departure steel balls are utilized in many applications ranging from heavy-duty bearings to the new special ball pencil. To accommodate these applications, New Departure steel balls are offered in sizes ranging from .002 ball to 10 1/2 inches in diameter.



NEWS DIGEST



New Tail Armament For B-52

Wichita's first B-52 shows a new tail armament, probably the fourth different system to be incorporated in the Boeing four-engine bomber. The jet bomber's battery appears to be far more automated around a tracking radar antenna. Above the turret is a larger search radar and above that an optical sight for the tail gunner.

Stuart Tipton Elected President of ATA

Stuart G. Tipton was elected president of the Air Transport Association last week at a board of directors meeting in Washington. Tipton, who has been general counsel of ATA for the last 11 years, succeeds Harold Pearson who declined not to stand for reelection after his policies were rejected by ATA directors.

Charles J. Lewis, Jr., was sworn in as Civil Aviation Administrator last week, succeeding Fred B. Lee (AW Dec. 12, p. 112).

Lewis's appointment immediately was attacked by Sen. Mike Mansfield (D-Mont.), chairman of the Senate Commerce Committee's Aviation Subcommittee, who challenged Lee's resignation under Administration pressure. He has threatened to conduct an investigation of the Lee resignation in "an attempt by the Commerce Department's grand-standing clique to stave control of all civil aviation."

Charles Vaughn's F-104 Crusader has been 1,250 mph in tests at Edwards AFB, Calif. The Navy fighter is

powered by a Pratt & Whitney J57 engine. Defense Secretary Charles E. Wilson recently asked permission for the Navy to make an official attempt to break the world speed record in the B5U (AW Dec. 12, p. 7).

United Air Lines announced a settlement with its striking AFL-CIO flight engineers, ending a seven-week walkout. The engineers, whose strike forced to protest a company ruling that all newly hired engineers be qualified pilots. One provision of the agreement provides that new-pilot flight engineers already employed by United will be given flight training to bring them up to the level of the new engineers.

Air Force has awarded Ford Motor Co. a \$265,775,900 contract for J57 jet engines. The engine was designed by Pratt & Whitney.

New bearing-orientation system for spacecraft bearings will be produced by International Research Machines Corp. under an \$11.6 million Air Force contract. The system, developed by the company's Aerospace Computer Laboratory, personally employs the new digital techniques.

Air Force awarded \$1,251,380 contract for five mobile training units for the B-52A fighter plane to Convair Division of General Dynamics Corp. The trainers will be built by Burtis Rodgers, Inc., of Cincinnati in collaboration in Canada.

Mohamed Anwar carried 26,935 jet engines last month for the last November total in its history.

Foreign

Despite official denials, Australia's Queen Elizabeth Airways will place an order for long-range jet transports early next year. The government-owned airline probably will turn to either Boeing or Douglas, although British political and economic pressure is being brought to bear for the purchase of the Harland's Comet 4.

British Orpheus turboprop engine will power the Fiat G-91 light fighter being produced for the North Atlantic Treaty Organization. Under the contract signed by Fiat and Bristol Aero Engines Ltd., Fiat also gets exclusive rights to the manufacture and sale of all British turboprop engines in Italy.



Left to right, from top to bottom: McDonnell F-121, North American P-100, Cessna F-119A, Boeing B-29, North American B-24, F-105, and F-105, Lockheed C-130, Hughes DC-7, Sikorski HO4S and SH-34.

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Washington Roundup

Honaman Out

R. Karl Honaman has resigned as Deputy Assistant Secretary of Defense for Public Affairs, as quoted by Associated Press (Dec. 5, p. 11). He will return to Bell Laboratories, but the aviation industry probably will find itself with serious press problems that get worse instead of better. Honaman is top adviser of security questions appear to have been taken up by Lee M. Hedges, Deputy Director of the Office of Security, Review. His immediate need was an order that, in effect, takes away all participation of military service representatives in the security review office known then to go to Defense Department for no reason of the type sought by aircraft industry representatives. Hedges usually issues these rulings, traditionally with no regard to previously released information. Before Honaman left, the Security Review Branch received verbal orders putting a ban on release of performance data before a new plane is shown has been in service for a year. Actually, exact performance data were disclosed and the existing handbook on "Admittable Information for U. S. Air Force Aircraft" was drafted with this policy in mind.

CAB Scramble

Scramble for the Civil Aeronautics Board chairmanship is in full swing with the prospect that Ross Bailey will receive the post as soon as he is nominated for a Federal judgeship in Oklahoma early in January (AW Dec. 12, p. 11).

Present Administration plans are to nominate Bailey's resignation from CAB, but appointment to a judgeship, and has CAB successor simultaneously.

Three leading candidates for the post are:

- **Franklin Stone**, 45, general counsel of the Civil Aeronautics Board. Stone who came to this post from a private law practice in Western Mass., served as Western Canada Chairman of the Republican Committee. He is a former FBI agent, served with the Office of Strategic Services during World War II.

- **Warren Baker**, 41, general counsel of the Federal Communications Commission. Baker is a former Air Force lieutenant who served as executive assistant to former CAB chairman Oswald Ryan, a Republican. He is from Indiana.

- **Karl Kimbacz**, 41, general counsel of the Federal Trade Commission. Kimbacz, also an Indiana Republican, joined FTC in 1948 as a trial attorney. He served in the Navy during World War II.

These three candidates meet the broad qualifications for the post laid down by the Republican National Committee. The committee wants a member generally in Government so that there will be no delay in his immediate appointment because of security clearance.

Defense Operations

Department of Defense is running some struggle into the operating business of the Army, Navy and Air Force. Manifestations are the facts noted by Assistant Defense Secretaries Park, Newberry (Applications Engineering) and Thomas F. Pike (Supply and Logistics) and Deputy Secretary Stephen B. Robertson. The nation is bogged down because it seeks economy, full utilization of technical resources and a cash on inter-service rivalry. However, there are race in uniform and in industry who feel that

a lumping of requirements and rules pay too little of tribute to individual service requirements. Full budgeted elements were that the head race had to submit of the three armed services, establishment of a single set from and military establishment. This also has received further support from James Macgregor Macgregor, but he did not get the concept as his recent tour of the U. S.

Pay Limit Reason

Manifestations who accepted large overpayments on executive-type contracts and avoided the money in Government bonds while waiting for the Navy to order more the price were responsible for the 105% limitation placed on payments by the Defense Department. In a frank statement to the National Academy of Administration, Rear Adm. Robert L. Stewart, Vice Chief of Naval Material, said he understood industry's objection but under the old system the Navy had too much in its hands, actually waiting for someone else. He proposed action to speed settlements under revised Defense Executive Order 4155-2 (AW Dec. 12, p. 13).

Sandia Mountain Crash

Last word hasn't been written yet on the Civil Aeronautics Board accident report covering the Trans World Airlines crash on Sandia Mountain near Albuquerque Feb. 19 (AW Nov. 25, p. 80). That will probably be the second CAB accident report prepared by industry pressure pointing out facts rejected in the final report. First was the Northwest Air Lines Seaboard accident during Korean war contract operations as which a covered report was recently issued by CAB (AW Nov. 25, p. 115, Dec. 12, p. 101).

Seaboard Bid

Latest interest in the bidding for operating contract of the proposed American National Airlines is Seaboard Air Lines, recently certified for an all-cargo transatlantic route. Seaboard has the route track on an American deal by a New York-Venezia line. The all-cargo line has picked up the suggestions in the past that were dropped by the domestic non-scheduled carrier group, North American Airlines.

Seaboard has a number of advantages in an operating contract with the Airlines as its interest in its own scheduled services all cargo services which will start soon. Equipment is no problem for Seaboard, which is what found North American to abandon its plans. Seaboard is operating a mixed fleet of DC-6s and Super Constellation, as well as two of the latter one of the line to South American Airways Corp. until April 1956. An additional order for 1048H Constellation was placed by Seaboard with an asset as the financing from a new company which includes NAA officials.

Pearson Job Hunting

Harold "Pete" Pearson, recently fired as president of the Air Transport Union (AW Dec. 12, p. 11), is actively seeking appointment as an Assistant Secretary of the Army. The chances are slim. Pearson previously served with the Department of the Army as an assistant to Earl Johnson, Pearson's professor in ATA, president.

—Washington staff

AVIATION WEEK

U.S. Plans to Launch 12 Earth Satellites

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1957-58 launchings probably will be staged in Florida. Satellite observation a major problem.

By Philip J. Klein

New York—The U.S. plan to launch 12 earth-satellite vehicles during the 1957-1958 International Geophysical Year pending Congress possesses the necessary supporting funds.

The satellites probably will be launched from the Air Force Missile Test Center, Patrick AFB, Fla., although the Air Force-Warner missile range is another possible site.

First figures on the number of satellite-like launchings planned, plus other facts, were disclosed in a report by Dr. James Van Allen and Dr. Martin Summerfield at the joint meeting of the American Rocket Society and the Institute of Radio Engineers.

Van Allen, head of the State University of Iowa's Physics Department, is a member of the Upper Atmosphere Research Panel. Summerfield, former head of rocket propulsion at the California Institute of Technology's Jet Propulsion (ramjet) Laboratory, is now professor of jet propulsion at Princeton University.

Dr. Van Allen revealed that:
 • Keeping the satellites aloft, observations and recording of vital meteorological data, is expected to be "more difficult than getting the satellite up into its orbit."
 • Radio-beam satellites, using one-stage rockets as an alternative

to an extended three-stage rocket launched from the earth, are under consideration by American authorities as well as by some U.S. missions (AW Oct. 10, p. 45).
 • U.S. scientists, who made up the original satellite proposal for the Geophysical Year, got no advance indication of top-level approval prior to the official White House announcement (AW Aug. 8, p. 9).

• Satellite orbit probably will be a diagonal flight path, a compromise between a polar and an equatorial orbit. The line-out of the launching stage itself will be a determining factor in the direction of launch and hence the orbit.

USA's Florida range is inclined about 45 degrees from north and points in an easterly direction, an advantage since the satellite would gain a portion of the earth's rotational velocity.

Satellite Life

The useful life of the satellites before they slow down and orbit into the earth's atmosphere where they will disintegrate will depend upon the initial orbiting altitude achieved. In estimating the useful satellite life at different altitudes, Summerfield and Van Allen came up with slightly different figures.

Summerfield predicted a satellite life of about one year if the initial orbit altitude reached a 100 miles.

The life span would drop to 15 days at 100 miles altitude and less than one hour at 100 miles, Summerfield said.

Satellite Award

Contract to the second stage of the three-stage rocket vehicle to be used in the Project Vanguard earth satellite program was awarded by the Navy Department to Aerojet General Corp., Azusa, Calif.

The Glenn L. Martin Co. is working on the first stage of the rocket vehicle, first stage of which will be an improved Viking rocket. General Electric Co. is building a more efficient rocket motor for the Vanguard. Contract for the third stage of the launching vehicle, which will contain the accelerated satellite, has not been awarded.

Van Allen calculated that the satellite life would be "useful" while it is at an initial orbit altitude of 150 miles, and about a week at approximately 100 miles.

The final velocity of a three-stage rocket required to put the satellite into an orbit 400 miles above the earth was estimated by Summerfield to be between 27,000 and 28,100 ft/sec. depending upon the technique to be employed.

This compares with the classical "escape velocity" of 36,700 ft/sec., at 14,700 ft/sec. needed for an intercontinental ballistic missile with a 7,000-mile range. (The German V-2 achieved a launch velocity of 5,000 ft/sec.)

Ballooning Ascent

The higher velocity (29,500 ft/sec.) is needed if a direct ballistic ascent path is chosen altitude is used. The latter velocity would be sufficient, Summerfield said, if the rocket employs a tangential approach path to its orbit altitude.

It is not such with this altitude, however, until the satellite is well way around the earth, 12,500 miles away.

Because a lot more heat of energy is needed to launch the satellite free of the third stage rocket and into its orbiting path, the notion of this orbital operation would be extremely difficult if the rocket is half way around the earth from its launching site. Summerfield suggested as an alternative a modified ballistic ascent in which the vehicle would coast for a while between burn-

out of the second stage and the firing of the third stage.

He presented the analysis of two calculations as to the performance which might be achieved by each stage of the satellite rocket based on the altitudes of the Viking II and expected advances in the state of the art since it was designed by Martin in 1913 (see table page 12).

Scientific Exploration

Dr. Van Allen emphasized that the U.S. satellite program "definitely is not a replacement to cover up military use." The project, he said, will be under civilian control and cover questions in the world "will be dealt in the public." (Some of the findings, however, undoubtedly will be useful to intercontinental ballistic missile development, which explains why the Defense Department is supporting the venture until Congress recommission and authorize a supporting appropriation.)

Van Allen called the satellite program "a logical extension of present geophysical studies, which previously have been carried out with high altitude sounding rockets such as the Viking Earth explorations, however, as so hard they provide only "an occasional and shattering peak" into the upper atmosphere, Van Allen said.

The satellite will enable scientists to make much more comprehensive measurements and determinations of such things as:

- Cosmic ray energy level, which is greatly attenuated by the mass of the atmosphere. The vehicle also will enable scientists to measure the variation of cosmic ray intensity at different altitudes.
- Correlation between solar ultraviolet radiation and the changes which take place in the ionosphere "E" and "F" layers, which at times often absorb all long-range radio propagation.
- Whether new radioactive isotopes of lithium, beryllium and boron, which have been detected in previous satellite soundings, exist in the cosmic radiation at 400 miles from earth space or whether this would have a reaction with the earth's atmosphere.
- An density of the upper atmosphere. Very, weight information is available on the density of air at altitudes below

150 miles. The rate at which the earth satellite altitudes will make it possible to calculate an density of air orbit.

• Severity and frequency of meteoric showers encountered in the upper atmosphere.

Scientists who are anxious to learn more about the new type of radiation, a sort of "soft X-ray" (15 to 25,000 volts) which appears to be concentrated at a latitude of about 65 to 70 degrees, is the region of the Aurora Borealis.

Big Enough to See

Satellite size will be determined partially by the satellite size which can be seen at night. Van Allen said. He reported that a 30-inch diameter vehicle, when looked near the horizon at dawn, will reflect sufficient sunlight to appear twice as bright as the faintest star visible to the naked eye.

On this basis, Van Allen predicted that the satellite vehicle would measure two to three feet in diameter and weigh 20-40 pounds. Its shape would be "spherical, conical or disk," he said. The satellite size (radius) will be only 23 cm, Van Allen said, so that its designation will be named when it is in the atmosphere.

Data Collection Problem

"A major portion of the entire satellite undertaking" is the problem of observation and teleconferencing of the satellite's vital scientific measurements, Van Allen continued. The satellite is, presumably, required to make one revolution around the earth every 90 minutes. However, because of the earth's rotation inside the vehicle's orbit, the satellite will sweep past a different portion of the globe during each successive orbit.

Because of the modest amount of electrical power available for the satellite, it is actually its teleconferencing instrument, 200 ground receiving stations, would be required for continuous data relay.

The required transfer of ground stations could be greatly reduced by having radio contact with the satellite to make every 90 minutes, providing some lightweight means can be found to transfer satellite measurements between radio frequencies.

Solar batteries, made of silicon and cells which can generate nearly 5 watts per pound weight, appear to be the most promising source of electrical power, according to Van Allen. Solar storage batteries will be caused, however, to provide power when the satellite vehicle is not exposed to the sun.

To conserve solar cells, power, at least another month, will be required to transmit data when interrogated by an official ground station. The U.S., however, proposed to publish the vehicle's data during frequencies and schedule.



ADVANCED VERSION OF VIKING II (left) will be the first stage of three-stage rocket that will push the U.S. earth satellite vehicle into its orbit 400 miles above the earth. The Martin rocket below the altitude would be the second stage, having already 100 miles above the Navy's launching site at White Sands Flaming, Calif. N.M. The satellite's second stage rocket will be designed by Aerojet General Co. The third stage rocket has not been announced.

Satellite Characteristics

Comparison of Viking II and Estimated Satellite Rocket Characteristics.

	Viking II	Rocket's Satellite		
		1st Stage	2nd Stage	3rd Stage
Specific Impulse	255 sec.	240 sec.	230 sec.	265 sec.
Grav. Mass	51,000 lb.	15,000 lb.	2,000 lb.	200 lb.
Thrust	24,000 lb.	55,000 lb.	5,400 lb.	710 lb.
Range	400 mi.	50 mi.	30 mi.	10 mi.
Acceleration	2,000 ft/sec.	1,000 ft/sec.	300 ft/sec.	10 ft/sec.
Ratio of Structure to Grav. Mass	14-16%	32%	15%	15%
Perch	325 ft/sec.	2,000 ft/sec.	300 ft/sec.	10 ft/sec.
• Burnout	—	4,000 ft/sec.	11,200 ft/sec.	16,800 ft/sec.
Total Velocity at Burnout	—	7,800 ft/sec.	35,500 ft/sec.	58,800 ft/sec.

(Note: First and second stages use liquid fuel, third stage uses solid propellant.)

* Increment of velocity developed by each stage at burnout



LONG BELTS OF DOWN. technicians are holed into F-100 field during Exercise Sagebrush maneuvers, for which the 479th Fighter Day Wing managed to scrape together two F-100 squadrons with the necessary collocation flight, spare and skilled maintenance men



F-100 FIGHTS but maintenance peels through line of flying base, although they must have more cockpit talent than ever before



Shortage of Maintenance Personnel Curbs

By Claude Witte

Four AFM, Ten—Operational capability of U. S. Air Force's first super-sonic fighter, the North American F-100 Super Sabre, is seriously handicapped by USAF's lack of skilled maintenance personnel.

At headquarters base of the 490th Fighter Day Wing, American West, Texas, "Extremely serious of dollars worth of our fastest and most potent weapon systems are idle on the runway in 'double storage' status. This means they are good, weekly repairs to keep them ready for action, they are not 'jockeyed' and can be put into action quickly, but there are not sufficient ground crew skills to keep them operational at all times.

• Pilots of the 490th, among the best in USAF, are not getting their full quota of flying time and are disgruntled with the situation. The incoming program, however, is considered satisfac-

tory at this stage. Flight personnel are shifting from the earlier North American F-105 Sabre to the F-100C fighter bomber version of the super-sonic aircraft.

• North American Aviation, manufacturer of the F-100, is seriously concerned over the grounding of its newest product. The company has 35 of its own maintenance bases under contract with USAF to help train related personnel in maintenance of the new plane.

• A similar but less severe situation exists at George AFB, Calif., where the 479th Fighter Day Wing, operates the F-100A day fighter version of the Super Sabre. The manufacturer has 17 maintenance units at this base. The wing assigned to pool its resources and talents to provide two squadrons of F-100s for service with the Aggressor 80th Air Force at Edwards Airfield, part Army-Air Force command held last month in nearby Lancaster.

• Tactical Air Command is putting intense effort into its maintenance train-

ing program, seeking to upgrade all personnel and improve their skills. The North American mechanics are working with TAC on Operations Toolbox, a stringent schedule of both classroom work and on-the-job training to improve maintenance capability.

New Complications

Col. Joseph Wilson, commander of the 450th, 10th Airborne Warning and Control Wing, is almost fully equipped with F-100Cs. Aircraft have been delivered on schedule to meet his job, which marks the point at which the unit started to feel the personnel pinch.

In replacing the F-106F, actual title of organization for the 450th has been revised to keep pace with the increased complexity of the new aircraft. At the outset, it requires 1.9 men assigned at 2.1 to keep each aircraft in flying condition. With experience, this ratio will decline.

Pilots of the 450th, including Lt. Col. Robert Ross, operations officer



SUPER SABRE pilots are enthusiastic about plane's performance, but its capability is hampered by lack of maintenance personnel.

F-100's Operational Capability

for the 322nd Fighter Group, point out that in the shift from the F-106 to the F-100 the 450th acquired twice as much sheer weight and skill to take care of.

In addition, there is the added complexity of the new plane. All of the cockpit, fire-control system, fuel control and even such details as the advanced gauges lead to the new maintenance problems. The F-100's drag chute fire landing, its Pratt & Whitney J57 jet engine with three turbojets, two compressors and electric control create new problems for the ground crew.

At the Pentagon in Washington, the picture was summarized by Brig. Gen. Albert G. Havatt, USAF's Director of Maintenance Engineering.

Reasons for Problems

Gen. Havatt complained to Air Force West that the problem of maintenance skills is not fixed by USAF at all times, as the ground and flight crew go through transitions to new equipment

he said, however, that the problem has been especially critical in recent months. Here are some of his reasons.

• **Fiscal 1956**—which ends in June, is the period of peak attrition for USAF mechanics who were enlisted during the Korean buildup. Large numbers of newly drafted men have been entering to replace life and it will be some months before this year's scheduled attrition effort is felt. It will result in a leveling of strength and an overall improvement of the skill level.

• **Industry is competing heavily** for the services of skilled airplane engine and electronic specialists. North American mechanics working at Foster and George receive substantially higher salaries than related men.

• **In the post-Korea period** there have been major gains in the state of the art. Gen. Havatt points out that in World War II USAF could make good airplane mechanics out of farm boys with grade school education. Now USAF must start with high school

graduates when it trains maintenance personnel for modern weapons systems. It takes longer to develop the skills.

• **Increased complexity** of the aircraft. For each hour of flight on an F-100, each 200,000 more than 50 hours of ground work. The corresponding figure for the F-86D was 40 hours and for the World War II F-51 Mustang, it was only 15 hours.

• **In shifting personnel from unit to unit**, USAF must consider priorities. Tactical Air Command does not rate as high as the Strategic and Air Defense Commands. Within TAC, units needed for overseas missions have a priority over those based in the country.

• **Fast rate of aircraft delivery** in the post-war era. USAF has received its 117,000 goal, has added to the maintenance personnel problem.

• **The F-800**, first of the century-war super-sonic fighters, is drawing many mechanics from units that have been



LOW-ALTITUDE night photograph of Dayton, Ohio, recorded on film. Only illumination used in the experiment was three mercury arc lamps mounted in rear of a C-47.

ARC Lamp Utilized In Night Air Photos

A new night aerial photography system which produces continuous, high-contrast illumination has been developed by the Air Research and Development Command.

The new method developed by ARDC's Wright Air Development Center utilizes a commercial-type high-voltage mercury arc lamp to provide a narrow, directed beam of continuous light. Present night photography systems use flash bombs or flare cartridges that provide intermittent light.

Stranded film heads and cartridges produce a brilliant flash lasting only a fraction of a second, and dissipate light in all directions. Use of the mercury arc lamp enables Air Force reconnaissance aircraft to "sweep" light along the ground beneath the aircraft.

Air Force engineers in WADC's Night Vision Laboratory pointed out that use of the light eliminates the need for heavy, bulky equipment used with previous illuminants, in much less expensive, and also safer, since no explosives are necessary.

Although the active element of the mercury arc lamp is no larger than a cigarette, it provides adequate light for aerial photography. The light is directed in a narrow beam and is visible from a distance of several miles and is visible from the ground because of its narrow beam and bluish hue. On an approaching aircraft, the light appears as a distinct star to ground observers.



ENGINEER HOLDS the both used in new night-vision photo illumination system shown here exhibited in G-47 nose.

XH-17 'Flying Crane' Testing Completed

Calver City, Cal.—Three years after its first flight, the Hughes "Flying Crane" has completed its test program and proved the feasibility of personnel, single-engine helicopter for heavy duty cargo carrying, according to an announcement in the Aircraft Division of Hughes Tool Co.

Built under an Air Force contract and designated the XH-17, the large

engine has picked up a twelve-ton, target object over lifted by rotary wings, the company said. It did not announce how heavy the cargo was, but said a helicopter of the XH-17 design could carry loads of more than 10 tons.

For military use, the company said, an aircraft of this type could be used to lift a pod with TV troops and their combat equipment, a 155-mm howitzer, a 2½-ton truck, a bulldozer or an assembled bridge.

Hughes engineers found they could increase blade life and reduce stresses by as much as 33% in landing weights into the blade at strategic points. Blades on the XH-17 are 130 ft. in diameter.

In the recent Hughes tests, they were flown in excess of 70 miles an hour, lifting a gross weight of more than 40,000 lb.

The XH-17 is powered by two modified General Electric J35 turbines, forcing gas under pressure to tip blades on the rotor blades.

Second SeaMaster Ready for Taxi Tests

Second prototype of the Martin XP5M-1 SeaMaster, jet airplane which exploded in mid-air recently (AW Dec. 17, p. 7), will be ready for taxi tests in late December.

Navy Under Secretary Thomas S. Gates Jr., said last week the Navy is going ahead with the program and is "every confident" in the aircraft.

Gates and Rear Adm. J. S. Russell, Chief of the Bureau of Aeronautics, inspected the second SeaMaster at the Martin plant and saw the aircraft for the first time, which crashed in the Panama River.

No explanation of the accident has been announced, pending reconstruction of the wrecked aircraft.

Air Force, Navy Obligations Slump

Air Force contract commitments during October for aircraft and related items amounted to \$194 million, more than one contract less. Navy had no obligations only \$7 million in the same month.

Total obligations for both services since the start of Fiscal 1956 on July 1 are \$64 million. Air Force shows a contract obligation of \$124 million.

USAF now has an unobligated balance of \$10.5 million and the Navy has \$14 million.

Expenditures during October were \$494 million for the Air Force and \$134 million for the Navy. Expenditures for both services since July 1 amount to \$2.5 billion.



technical bulletin

Here's another New Hydraulic Pump MOTOR

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SPECIFICATIONS

TYPE E-750 HYDRAULIC PUMP MOTOR

Duty Cycle: 5.2 HP at 2200 RPM (intermittent) on 26 volts DC
3.5 HP at 2200 RPM (continuous) on 26 volts DC

Weight: 20 pounds
Military Specifications: MIL-PRC-150

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Lockheed Special Projects Group Speeds Airframe, Systems Design

To meet the fast-growing demand for rapid development of prototype aircraft design and special systems, Lockheed Aircraft Corp.'s Marietta (Ga.) Division has established a Special Projects Engineering Division within the Engineering Branch.

Starting with about 10 engineers and designers drawn from other phases of Lockheed's engineering activities, the new division will add another 100 men, clerical, structural and systems special staff within the next year, as the types required for that initial design work become available.

New Projects

The importance placed on the Special Projects Division is indicated by the

work already assigned there:

- Experimental design development of an advanced landing gear applicable to future aircraft and cargo aircraft.
- Research and development of attaching systems, fuel protection approaches and multi-purpose fuel tanks.
- Design of operational aids for special missions planned for the C-119B fleet.

Lockheed's Georgia Division was established early in 1971 to operate Government Aircraft Plant No. 6, at Marietta. Initial work was the "desubbing" and modification of 128 B-25 bombers which had been in long-term desert storage at Pyote, Tex.

There is a production contract for B-47 Stratojets in progress, which still as-



Full 47 helicopter recently saved the Swedish government \$300 and a week's time by ferrying a portable two-man house to a Swedish power project.

Helicopter Airlifts House



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pages about half the division's 10,000 employees. Since early 1954 Lockheed has performed an IRAN (inspect and repair as necessary) and modification program on B-47s. This has included some special project type of work where only a few planes were affected for specific modifications.

Lockheed Martin's development has been in a sequence somewhat difficult to describe. Build up of other major aircraft manufacturers. First the plant was engaged in the modification and production of aircraft designed elsewhere. Then came the production design and manufacture of the C-119, which was actually designed by Lockheed Martin, which also built the prototype.

Now the division has developed full engineering capabilities, including test and staff organizations for project design, structural drawings, production design test laboratories, flight test, zero clearance operations, research, performance design and special projects.

Broad Capability

The function of Special Projects Engineering is broad. Although primarily charged with design of experimental aircraft and components, it has the capability for basic design in various structural and mechanical details. The



Palas Jet on C-46 Wing

Turbojet Palas, turbojet and engine, is shown mounted on the wing of a Lockheed C-46. This is the first time an installation of this type has been made for passenger service by a U. S. modification house, according to L. E. Smith Aircraft Corp., Miami, which did the job. The turbojet's basic engine model was developed by the French firm, SNECMA, to power its own passenger line, SNECMA 1000, in 1948. L. E. Smith is installing the Palas turbojet on the C-46, which it is modifying to passenger configuration for the new-Columbian airline. The unit itself, together with the plane's engine, PWSA E3540 engine, gave the C-46 a total of 2,400 hp. for takeoff at 5,200 ft. high. SNECMA, SNECMA's headquarters in Columbus.



No Flat Spots, says Hy-Trol

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Hungry F-84F Thunderstreak

In Exercise Skybolt's testing scenario, Republic F-84F Thunderstreak slides into position behind KB-29 tanker plane.

objectives of the organization require the capability to:

- Design prototype installations and components which will be tested and evaluated for subsequent application to production aircraft.
- "Subcontract" design work required by staff and research groups for their development programs.
- Undertake independent research and development assignments concerning design studies and/or hardware when not usually a part of a specific weapon system.

- Infrastructure, tools and development equipment, for background and workload reasons, are not immediately requested in other Van divisions.
- Modify production methods for special task assignments.

Special Project-type operations provide significant economies in the design of prototype models or small production lots, Lockheed says. These economies result from use of a simplified drawing system, which does not require compatibility with IBM parts listing and production control methods; elimination of engineering checkouts as such; by utilizing small design teams and the "bubble" approach on individual components; and by close integration of structural analysis and staff contributions with the design effort.

Follow-up of experimental manufacturing and laboratory testing work is performed by the individual designers,

clustering planners, systems engineers and other "middle men." In addition, the isolation of Special Projects from the general and formalization demands of a large, active manufacturing organization enables supervisory and staff decisions to be concentrated on design problems rather than administrative and procedural matters, Lockheed says.

How It Works

These informality and economies do not mean a lack of schedule control and project coordination. Work on special projects is initiated by a Project Schedule Plan. Technical scope and ground rules are laid out by a Special Projects Division Memo, which is developed as soon as the basic approach is "frozen." Weekly project meetings between all disciplines on a given special project review assignments, coordinate design philosophy and plan detail work, and assure that any identified Schedule conflict is monitored by a job file, system that reports on a bar chart the day ahead or behind schedule position for each job.

The division is headed by W. B. Johnson, who joined Lockheed's California Special Projects organization 10 years ago.

Johnson was educated in mechanical engineering at the University of North Carolina. For 20 years he has been engaged in the prototype development and design of all sorts of aircraft

At Lockheed he has had various project and special project assignments, most recently as manager of the Preliminary Design Engineering Dept.

The design groups and group engineers average 14 men each and group experience. Some of the men have had extensive experience with European manufacturing and research organizations. A favorable combination of talent for special project design results when European and American approaches are merged, Lockheed says.

Convair-San Diego Spares' Sales High

Sales of aircraft and missile spare parts for Convair-San Diego during the last 10 months rose, close to \$26 million according to R. F. Skerrod, chief of parts sales. Customers included the military, commercial airlines, individual aircraft operators and vendors.

The spareparts, averaging 9 million lbs., represent some 75,000 items, from F-105A aircraft parts to small bolts and struts. The largest receiver of parts was the Air National Guard at Kelly AFB, Tex., which is USAF's prime supplier to units operating the F-105, the F-29 trainers, and other variants of the Convair 440 and 440.

Other big customers included Edwards, Hillhouse and Patrick AFBs and the Naval Air Test Center at Patuxent.



AS TACTICAL TRAINING COMMAND F-84F approaches flying boom (above), pilot opens wing folding panel. Boom operator strikes home (below). TAC's KB-29s will soon be replaced by pulse-jet-engine KB-90s, and Thunderstreaks will be modified to conform.





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POWERS CONVAIR F-102A



These photos taken on the F-102A production line at the Convair Div. of General Dynamics Corp. show the three Jack & Heintz a-c system components in process of installation. The

generator (left) mounted with a Sandstrand constant-speed drive is located in the aft fuselage. The control panel (center) and voltage regulator (right) are mounted in the ship's nose.

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AIRCRAFT EQUIPMENT

Fairechild Builds Short-Take-off Transport

By Robert H. Cothran

Fairechild Aircraft Division has revived a 40-year-old concept to provide a relatively fast, short-take-off transport designed to meet the needs of tactical warfare.

In the event of such a war, the need for flexible movements of troops and rapid evacuation of civilian would call for a fast carrying plane as fast as a modern transport and almost as versatile as a helicopter.

Fairechild's last step in providing such a transport is the financing of the M-232 test vehicle, which has been assembled at Dayton, Ohio. M-232 experiments will demonstrate to what extent certain improvements on wing deflected propellers as craft developed by William E. Haner can be utilized in a modern army transport plane. The Aircraft Division is licensed by use of this patent (No. 2,450,645, Aug. 21, 1950) by the Aero-Flight, the Wright Aircraft Engineering Corp. of Newark, N.J., and Eugene A. Monaghan, of New York City.

Performance objective for the M-232 project is to produce a plane that can get in and out of a 500-ft clearing in less than 50 ft altitude and then cruise at a speed comparable to conventional transports. For the M-232 demonstrator this will be 242 mph, but Fairechild hopes their future STOLs (short take-off and landing) will go over 300 mph. The M-232 will carry an embarking belly pod capable of carrying eight men or four horses.

While this particular STOL resembles Fairechild's C-119 in appearance, weighs only 7,000 lb., and its relatively larger propellers are boosted out well ahead of the wing. Even at low speeds, the 500-hp power-prop driven propellers (from Lycoming SC-150) maintain a slight advance over most of the wing. At the same time, the trailing edge flaps can bend the flow down, converting into considerable lift; the same propeller accelerated most of air which ordinarily produces forward thrust.

Turning-Vane Wings

The wings, therefore, act as conventional devices for forward high speed flight, but they are mechanically adjusted into something more like turning-vanes for hovering and up and down flight.

Although Haner's rights in high-speed propellers on planes, have been ac-



EARLY SEMI-HOVERING model was incorporated in 1907 patent of Dr. A. Zaluski

knowing this for a number of years by using engine power to shorten their corner landings, the conscious attempt to cover the entire wing and flap with propeller blast has had only limited application. The design is another U.S. attempt (along with the Rutan-Stok and Prof. Otto G. Kopp's helicopter design) to overcome some of the objections to STOLs.

While Fairechild is withholding most details of the M-232 until after the flight test is finished, many of its principal features may be deduced from the scientist's patent and a recent lecture last given before the Washington section of the Institute of the Aeronautical Sciences by R. A. Durb, preliminary design engineer of Fairechild Aircraft Division. They include:

- Propeller placed well ahead of wing and tilted down.
 - Large propeller blades which are both variable in pitch and flapable after the fashion of helicopter rotors.
 - Interconnected propeller drive shafts with overrunning clutches.
 - Full span trailing edge flaps.
 - Full span leading edge flaps.
 - Spoilers for slow-speed lateral control.
- These features incorporate to ensure the avoidance of effects of the thrust bending process and, more importantly, to eliminate critical velocities and control weaknesses during the "fast and slow" take-off and landing phases.

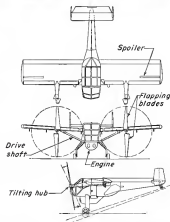
Haner's Contribution

Haner, who is serving as consultant on the M-232 project, says in his patent that he has made certain improvements over the Dugrold, the Groch-Rohr STOL type of the early 1930s.

Haner was an engineer on the Dugrold and has since bought out its patent. Despite eventual failure because of lack of interest, this project was actually a success in that the Dugrold could make 30 ft ground run take-offs and landings. Observers at that while flying as slow as 16 mph, the aircraft



GROCH-ROHR BEACONDFLY (above) made successful short take-offs in the early 1930s



PATENT DRAWING (above) by William E. Haner was basis of M-232 design

could get up and down at 10 and 70 degree angles.

The power transmission in most of the M-232 is based upon three considerations: One is that of providing a sudden forward thrust while operating at low STOL. Two is the necessity for keeping engine weights concentrated near the plane's center of gravity for quick, low-inertia response to controls.

The third is the aerodynamic desirability of placing the propellers at least one chord length ahead of the center of pressure of the wing.

Since the low speed propeller is at this angle cannot due up and down moving blades to go through the air at different speeds to reach the same rpm as helicopter rotor blades do when the helicopter is moving ahead, it is similar



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These weather items prepared in consultation with the United States Weather Bureau

TERRAIN

THE VARIOUS TYPES OF TERRAIN surfaces have a significant effect on the air masses flowing over them—with a consequent effect on the weather and plane performance.

One of the most spectacular effects of action on air currents is the Mountain Wave—a high-reaching deflection of the winds when a range of hills blocks a strong flow of air. This sets up a "wave" which may reach high altitudes and extend in a chain of waves for several hundred miles downwind. The Lenticular Type Standing Wave Cloud identifies these large waves. Even small ridges may cause air waves and produce dangerous downdrafts on the lee side (see diagram at right).

Care should be taken in approaching a ridge into the wind, because in a low-powered plane the downdraft may make it impossible to maintain enough altitude to clear the top. Also, when taking off on a runway somewhat hilly, be prepared for a decreased wind effect if the wind is coming over the hill.

When flying in the vicinity of mountain tops, the possibility of altitude error is important. Two primary factors can cause altimeters to indicate higher altitudes than actual. Low-level pressures caused by disturbed flow on the lee side and abnormally cold temperatures. Combined, they can produce errors in excess of 1000 feet.



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STOL FORCE VECTORS explain need of steep flap angle. Thrust lines show possible optimum boundaries.

flipping freedom has been provided. The patent shows a spring-loaded dumping system to restrain the blades about their flapping hinge.

Propeller Shaft Axis

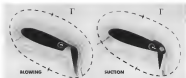
The propeller shaft axis angle which must satisfy the two widely divergent modes of flight proved so important in previous attempts that the Bolo patent provided for a pivoting engine nacelle and that's an improvement called for a swivelable flexible propeller hub.

For the time being, the N1252, probably will operate with fixed propeller axis, however, one of its designers says there is room for a tilting hub should flight tests indicate such a need.

One reason for the negative pitch to the propeller axis becomes obvious when the relative positions of the propeller, wing and tail control surfaces are compared as was done by Bolo in the Douglas patent—the consequences of corker air-borne craft. The push here is to get enough propeller work past the tail control surfaces at low speeds when most of the propeller lift is being deflected sharply down in the stall range.

In the covered 1931 patent of Dr. Albert F. Zahm (see Fig. 3), the proposed solution was to bend the section of the wing in the wake of the rotor propeller unhinged. Slow speed lift was sacrificed so that some propeller work could reach the empennage. In an early article on the subject, Professor T. H. Norton, who became interested in STOL from the study of birds, suggested a hinged flap so that the tail could be swung down into the deflected flow (Aeronautics Sept. 3, 1930, p. 90).

To understand how propeller axis placement can solve the STOL control problem, the forces acting on the plane while on the STOL regime must be considered. Unlike the other two aircraft, however, because in this case most when the STOL craft is used straight up, with flaps down, fixed propeller thrust (T) and wing flap reaction (R) cancel each other in the horizontal direction



FORCE CIRCULATION, such as the proposed blowing and suction methods illustrated above, may provide better performance in slower STOL aircraft.

and add as the vertical to equal the aircraft weight (W). Thus, negative propeller axis angles were, table and the tail, but at the cost of an uncomfortable take-off angle.

Safety Features

The pecking of the propeller pull against the wing flap reaction has not appeared in plans in the past, but it lacked the bid safe characteristics of the solution possibly given in landing. One pilot said the landing device of a conventional aircraft nose-up and slow-speed attitude was that of being right on the edge of a stall without flaps.

Although the STOL's safety is inevitably dependent upon the post-landing, landing edge slits, system and adequate flap just the tail are expected to give positive low speed control.

Yes, landing edge slits should reduce the wing pitching moment.

In the patent, the slats are shown mechanically linked to the trailing edge flaps and the propeller-blade mechanism. The special design spokes will handle lateral control, presumably on such the same manner as on the Helio plane (U. S. Patent 2,718,004, Sept. 27, 1955).

Other STOL Research

In addition to studying the Bolo-Helio approach to STOL, Fairchild research under Frederick Wagner is investigating combinations of forced circulation, working towards coefficient of lift as high as 50 (see diagram).

Both blowing and suction are used to draw boundary layer separation and increase the circulation flow, generate the results of these tests may be combined with the vectored airplane principle now used in the N1252 to further reduce this plane's stall characteristics. But Fairchild indicated that,



British Merry-Go-Round

Designed to allow human engineering data under into intensive conditions, the new blowing wingtip was recently installed at the RAE facilities of Aerobics Medicine in Farnborough. The controls, priced 10 ft, are in steps at human comfort in the air at each end of speeds up to 14 mph, measuring forces up to 300. A ground 1,500 lbs. diameter controlled by amphibious drive the vertical shaft from under the door. While the air is processed through automatically regulated inlet valves and monitored by a number of sensors, sensitive instrumentation transmits the subject's medical reactions to the control room.

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James Cameron

Veritas, 1994a;
Veritas, 1994b, 1995

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whether or not descending returns of lift come with increased blowing force, largely depends upon the particular wing configuration.

Goodyear Receives B-52 Subcontract

Consolidated Aircraft Corp. has won a record-sized contract of a multimillion-dollar contract for the construction of B-71 components for Boeing Airplane Co.

Under the long-term contract, wing and sustainer fuselage side panels, fuel tank assemblies and panels and fittings, subinboards will be manufactured by Goodson for Boeing's Seattle plant.

In addition, Goodhue also will produce speakers and displays, search for Boscov's Wichita location. All work will be carried out at the company's Litchfield Park, Ariz., plant.

Space at the plant already has been allocated and eggs and hatchlings from both breeding facilities will be shipped there in the near future.

Aluminum Expansion

Kaiser Aluminum & Chemical Corp. is planning a \$250-million expansion in aluminum production to meet anticipated doubling of U.S. aluminum needs by 1965. Ground will be broken in April on a 120,000-ton reduction plant at Rossmore, W. Va., and a 500,000-ton alumina plant on the Mississippi near Commerce, La.



XY-1 Convertiplane Jet

Clamping shows one of three pressure jets used for the vertical flight of the McDonnell XV-1 convertiplane. Each of the three other blades has one of the McDonnell-developed jets at its tip. The jet engine shaft is housed by sliding Hittell alloy X shaft in two halves and then welding them together. Haynes Stellite Co., maker of Hittell, ran the nickel-based alloy over chlorine because of its strength and high-temperature characteristics—the pressure jets are subjected to 1,800-psi forces at temperatures up to 2,500°F in the XV-1—and because it is easily welded and formed.

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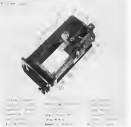
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PICTORIAL INSPECTION—Assembly is checked against labeled picture and instruction sheet; typed picture sheet shows at right.



Quality Control, Reliability Plans Bring Dividends to Eclipse-Pioneer

By Henry Lefler

Edgemoor, N. J.—The Eclipse-Pioneer Division of Bendix Aviation Corp. is beginning to reap the benefits of a three-pronged attack on the problems of reliability and quality control.

The new program already has paid off in a sharp reduction in the number of field complaints of the company's gas, turbine and engine instruments, according to Robert Nitzke, director of the division's quality control. Furthermore, the company can now better take corrective action when difficulties are encountered in the field.

The final bonus the company hopes to derive from the program is a head start on meeting requirements of future military specifications.

Combination of New and Old

Importance of quality control to Eclipse-Pioneer is indicated by the precision nature of the company's products list. The division makes light, navigation and engine instruments and components for military and civil customers. Products include automatic pilot systems, altimeters, pumps, compasses and various types of remote control and remote indication systems.

The threshold program, which is in addition to the usual quality control procedures of any large production

plant, is a combination of the new and the old. Its steps follow:

- **Product Reliability Laboratory**, opened a few weeks ago, where equipment is being tested for beyond normal military and commercial specifications, to determine actual operation limits and propose possible design improvements.
- **Pictorial inspection** procedure, in-

vented by Eclipse-Pioneer to be unique in this field. Eclipse technicians at various stages of assembly are able to check equipment against pictures showing how it should look, and follow simple inspection instructions.

• **Standards laboratory**, equipped with a super-resolution dollar worth of master gages and instruments, the standards by which all shop secondary master measuring devices are set.

In addition, a separate Service Inspection Group is now in sound the alarm if field reports of any particular item go too high.



GYTOSCOPE is adjusted during routine run-in on heavily used before shipment.

Eclipse-Nitzke in the quality control effort in a staff of 490, keeping tabs on the division's 1,000 production airplanes.

Product Reliability Laboratory

This recently formed department, under William Lechte, is not yet fully equipped. It already has in operation, however, a pair of environmental test ovens, walk-in cold-dry altitude chambers, unchambered and electrical cycling shacks and various types of vibration equipment for qualification, life and reliability tests.

The laboratory not only runs tests on new developments but also subjects standard Eclipse-Pioneer products to new, more rigorous conditions.

The tests are stopped before the point of failure, Nitzke says, more can be learned from study of the equipment while it is still whole. Lechte chooses the evidence, not a looking for, he says.

Two important advantages have emerged from the program:

- **Weaknesses** turned up by the tests correlate closely with actual troubles that occur in the field. As a result, Eclipse-Pioneer is able to initiate corrective action before a part becomes a matter of customer concern, or where reports from the field indicate the need for change. The division can move to make the necessary fix.
- **The tests establish the final limits** of the company's equipment and show the design points which need action to enable the equipment to meet more rigorous specifications than now in use.

The environmental oven is a heat unit, each built holding three drawers. It was built in Edgemoor from Eclipse-Pioneer space. The two drawers, each controlled oven chamber are selected from each other, so that one can maintain a continuous temperature of 400° (the unit is 600°) while the other is at 100° for instance.

The drawers are accessible. This equipment can be returned to them on the work benches and accessories can maintain fluids and read out before the oven is heated. Cables are brought out through swaged plugs.

The basic design of each chamber is cylindrical, six feet girth about. It can take a complete subassembly mounted on a Scoville table, so the unit can be put through simulated motion tests in the oven to see how the drift and accuracy of the microscope is affected in elevated temperatures.

Pictorial Inspection

The pictorial inspection technique developed at Eclipse-Pioneer takes the old visual picture check, but as its point of departure. To this check list is added a photograph of the piece of



EXTRA-LARGE DRAWER is 12-inches and one false adopted on turbine road.



STANDARD LABORATORY checks every secondary master in the plant before a year

equipment as it should look in the particular stage of assembly. It consists of a complete series of labeled pictures showing the equipment at various stages of assembly. Facing each picture is the appropriate checklist. Now, for the next operation described above, the check list says "Check these screws (No. 3) holding motor bracket (No. 5) to frame (No. 1) for tightness and freedom of horns and rotation."

The screws sample enough, but it isn't stiff to possible ambiguity, because in operation personnel might occasionally get the screws with correct screws (class of parts). Further, when an inspection was assigned to a new piece of equipment, a fairly lengthy rotation period might be required.

With the pictorial inspection method

a complete longest manual is made up for the equipment. It consists of a complete series of labeled pictures showing the equipment at various stages of assembly. Facing each picture is the appropriate checklist. Now, for the next operation described above, the check list says "Check these screws (No. 3) holding motor bracket (No. 5) to frame (No. 1) for tightness and freedom of horns and rotation."

Individual inspectors do not receive the complete manual with these pages covering their particular phase of the assembly.

Engineer Victor lead of the statistical quality control group and the pictorial inspection program, says that although it is still in its "building



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clothes" (mascots for each) those of the company's gyroscopes have been completed since the program started in October) it is already paving off in better and more thorough inspection.

The company plans to catch up with all important current production items, a job which will keep the department busy for many months and then move into preparation of manuals for new items. It takes several weeks to complete a manual.

The technical inspection manual section works closely with production personnel in developing the books. Later, when they have caught up with the backlog, technical inspection people will set up on pre-production meetings with the aim of having manuals ready when an item reaches the production stage.

Standards Laboratory

Henry Deckert, an old-time tool and die maker, heads the Standards laboratory. He brings to the lab the practical contacts of his former work, looking in terms of microns and hundred thousandths of an inch.

Each of the 750 standard master gages in the plant goes through Deckert's department twice a year for checking, and re-setting when necessary. Deckert puts a date tag on each screwdriver after it is checked, and the gage may not be used beyond that date without a check. The lab contains more than 50 types of mechanical master instruments and about 25 electrical-electronic standards. Deckert has also the lowest gages, and his counterpart, Nicholas Komarsky, takes care of the tops.

The very heart of the standards lab is a set of Johansson AA gage blocks that are accurate to within ten-thousandths of an inch. These are used for checking a Johansson A set which is accurate to four millionths. The AA set is the lab's grand master and the A set is the master. The remainder of the mechanical gages in the shop are referred to the A set.

The laboratory's own precision master barometer is one of only two in the country, according to Deckert—the other is at the Bureau of Standards. Both of the units were made in Elgin, France.

Among the other precision gages in the laboratory:

- Visual gages, made by Sheffield, for checking taper gage plug thread gages accurate to scale plus or minus .00025 in.
- Toolmaker's comparator, made by Garlock for checking hole locations and centers on gages concurrently, reads accurate to .0001 in.
- Micro-AC electronic comparator, made by Cleveland Instrument Co.

New and Old from North American



F-24 FURY turbo-bored Navy fighter comes down the fast runway at North American Aviation, Columbus, Ohio. Stealing out on a Navy version of USAF's F-16, before the Fury has evolved into a completely new plane. This latest Fury would be Wright J67W-4 of 7,000 lb thrust.



SERVICEWORK F-4B's are modified and modernized at North American Aviation's Fresno, Calif. Division. Following complete modernization, the plane's are brought up to latest service standards. Shown in background protect modern from hot sun during the night.

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

By Marvin Miller,
Scott's Minister, Aviation Writers Assn.



Power, drag and time are fast combining to build big head-aches for equipment producers as well as aircraft manufacturers.

These, as you know, are the basic elements of the so-called "lean burner," a misnomer, for it's no well-defined line such as the sonic "wall." Rather, it has infinite depth under the favorable law that the faster you fly within the atmosphere—and the longer you fly fast—the better you'll get.

Friction is the key word in the best problem for aerospace manufacturers and, indirectly, for equipment suppliers. Skin friction builds energy that is dissipated as aerodynamic heat into the dragging boundary layer of air in immediate contact with an airfield. Given enough speed and enough time, the boundary layer will transfer terrific temperatures to the plane's structure by conduction.

The thermal gain due to the conduction is phenomenal, although some normal 100-degree heat has been heard that even a heated bleedoff device on intermetallic temperatures run 50, they don't get out, about one degree at 40 miles per hour. An air liner flying at 300 miles per hour will record a 40-degree increase.

But not only a plane gets into extreme speeds does the aviation designer face better weather. At one speed for instance (on a normal day at sea level), temperature may go to 200 degrees (F) on a sustained run. At Mach 2 may well reach approximately 100 degrees and at Mach 3 perhaps 1800 degrees.

The thermal stress poses all types of problems for the aerospace engineer to avoid stress and strains, scaling and warping, which have been closely considered heretofore. His design must have a discussion of heat or at least boundary fire which has included heat. On a normal plane and not the heat which can attack and corrode that will be less affected by burning engine exhaust, a whole new field of investigation, although thermodynamics have long been aware of the heat problem.

Power drag demands must worry about such factors as non-closure between cooling and cooling, the heat in itself, and engine material, materials, and their own face the great complexity of cooling systems for the cockpit and the aircraft skin as well, systems that involve their own problems of weight and complexity.

But the best problem does not belong to the aviation engineer alone, although he faces the most vital difficulties. It belongs also to the equipment manufacturers, the companies that produce the valves, the lines, the pipes, the electronics and automatic controls—all the myriad items that make up the "hot engine" of the bird.

For equipment firms business can't take heat that the plane has, but, rather, directly or in the performance of its mission.

At present, equipment suppliers are being advised to plan for production units that will operate efficiently at a stabilized 300 degrees plus. In other words, valves, for instance, must be capable of functioning at this temperature within the freedom of heat and without special air cooling.

It cannot be said what relation this temperature bears to speed as that, however, the new method of cooling. For the time being, aerospace valves have not been developed, and the valves are difficult to place where someone will be used and what temperature drops can be achieved.

It cannot be said what equipment must operate at 300 degrees plus in a big enough chassis for an opening space but in the form of the valve.

This makes that equipment too, and work out much, use materials and new designs for their valves. Furthermore, they will be faced with extra special design for the weight and the resistance to type of the acceleration weight that cooling systems will not be expensive, expensive. And their own demands must be placed and added to check reliability under famous like conditions.

Any number of greater problems can be foreseen: and just about be satisfied as had in long-term tests, they must go into particularly accurate design facilities with no special cooling available.

The stabilized 300-degree plus design level is a general expectation. It shows no special problems with itself, but special ones for even higher temperatures will take equipment to the next even faster into the thermal stresses.

It can be said in all truth: The heat is not!

can be read to 000005 in
• Electronic, made by Taiting Equipment Co., test spring elongation

• Universal path measuring machine, made by Sheffield, measures external and internal leads on threads and gears, accurate to 000005 in

• Fine ledge growth surface plate, 100 in, made by Thomson Stuart and Co., made, a Sheffield plate steel surface plate, accurate to 000005 in

• Electronic universal external comparator and a Putt & Whitney standard measuring machine for external threads, plugs, wires, both accurate to 000005 in

• Inductive electronic indicator, made by Cleveland Instrument, for checking inside and outside diameters and general surface plate work, accurate to 000005 in

• Crystalline square, made by Taiting Equipment, for checking angle blocks, lens, parallel, etc.; the plate is only 000002 in. of error in 10 in.

• Naval Observatory laser signal receiver, made by Mettlen Electronics Co.

• Frequency counter, made by Fluke-Precision, precise under \$175 at \$50 per

• Vacuum tube precision testing fork, • Motor transmitters.



Novel Incentive Plan

Employees of Topp Industries, Los Angeles subcontractor of aircraft instruments and components, are shown the value of a Navy P-40 Skyhawk at Douglas Aircraft Co.'s Los Angeles International Airport installation. The P-40 is equipped with a number of Topp airborne devices, including eight of attack and identity control systems. Topp's president, R. E. King, says the employees who make the difficult electronic components gain added incentive when they see the actual plane flying over the desert. Topp transported more than 200 employees in chartered buses for the P-40 inspection.



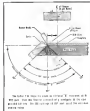
AUTOMATIC ROUTER used to machine variable angles at Comstock Works.

Variable Router Uses Electric-Eye Scanner

A new automatic router which employs a photo-electric scanner to continuously machine variable angles is now in use at the Comstock Works plant of General Dynamics Corp. The router will save about 35% in manufacturing costs, Comstock says.

The machine was designed to fit a need in the photo's fabrication department, where cone-shaped surfaces were being used to cut the variable angles in steel-aluminum blocks. High-speed tooling and in the machining of production parts from slugs material.

Comstock had designers felt that such a universal router could much be to do with when it comes to machining a surface where the degree of angle varies. Furthermore, manual operation, the danger to make frequent set-up and change-over was costly, time in the



HOW SCANNER ADJUSTS router angle

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the videographic reader. Angle of cut is
determined by distance from edge of lime
plate to the tilt bar.

manufacture of Hydrogren and
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The master operator must make reel take-ups as strong, low-trim and along the center in relation to the master take. He must make specific adjustments frequently to maintain the proper relation between the center and the master lengths.

When a conventional router is used, the operator must hand-finish the cut to blend the ends, remove chatter marks, and polish the working surfaces of the tool.

To meet these objectives, the manufacturing research and development section of D. Warr's tooling department developed the new master.

With it, the operator can make smooth and accurate cuts through cut complete cutting cycle. He can make variable-angle cuts either manually or automatically, with each a slight adjustment of the water controls. He can also make heavier cuts and save time that was previously required for finishing.

The toolmaker sets up the job for the variable angle router by preparing the template which will later be secured to the top of the material that is to be cut. The router's effect is black on a white template, and makes the tilt lines as if in a contrasting color.

The contrasting color of the tilt lines centers the photo-electric scanner on the target. The angle of the cut is determined by the distance from the edge of the translation to the tilt line.

The successful operation of the meter depends on the operator who has set the tilt bars by using a tilt bar selector to obtain his data.

General construction of the router includes a strong all-steel machine base, supports and work table. The photo scanner an attaching feature employing mechanical gearing and the mechanical overload to assure safe operation and a two-way adjustable router head.

Electro-Cutlery & Co., Rockford, Ill., has been licensed to manufacture the racket.



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Telling the Market

Setting up problems for electronic computer programming is speeded by new method developed by Elmer M. Mariani; method is described in Data File 170, Department NR 70, Berkeley, Da. of Berkeley Instruments Inc., 1230 Wacker Ave., Richmond 3, Calif.

Criteria and Test Procedures for Electromagnetic Delay Lines is one of Technical Paper 491, available from Helmut Technical Information Service, 915 Mythen, South Pasadena, Calif.

Laminated materials, and how they may be applied in the electrical and electronic industries, are described in fact file available from Standard Metals Corp., 262 Broad St., North Attleboro, Mass. Marketing for airplane production of omniplier, special-purpose electronic valve is described in bulletin on Douglas Variable Pitch Plastics, Ciba Inc., Douglas Research, Inc., 2280 S. Figueroa St., Los Angeles 7, Calif.

• **Textbook Aerodynamics.** Third Edition, by Karl D. Wood-Park, is the author, distributed by University Book Store, Ann Arbor, Mich. Textbook on aerodynamics for the engineering student as a refresher course for the practicing engineer.

• **Holistic and Parametric Operation of Machines**—by H. C. Towns—Pub. by Philosophical Library, 15 East 40th St., New York 15, N. Y. \$7.50, 191 pp. Information on the use of oil or coal powered air for driving and controlling machines and vehicles.

• Jet Propulsion Turbines—by Valerie C. Firth—Pub. by Natural Press, 439 Alca St. Palo Alto, Calif. \$5.00, 325 pp. Introduction to the theory and operation of turbojet engines.

• **Technical Aspects of Air Transport Management**—by R. Dixon Spies—Published by McGraw-Hill Book Co., 110 West 40th St., New York 36, N.Y. 50 50 716 pp. Airline management and the technical aspects of airline operations.

• **Practical Air Navigation, Seventh Edition**, by Thomas C. Evans—Pub by Aeronautical Services, Inc., 229 Prince George St., Annapolis, Md. 21403, 476 pp. Guide to all phases of air navigation.

• **Introduction to the Study of Chemical Reactions in Flow Systems**—In: S. S. Francis, Ed., *In: Batteries and Sensors*.



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- 1/8" to 4" O.D.
- 1/16" to 1/2" Wall
- 304, 316, 321, 347, 354, 360, 360H, 360L, 360M, 360N, 360P, 360Q, 360R, 360S, 360T, 360U, 360V, 360W, 360X, 360Y, 360Z, 360AA, 360AB, 360AC, 360AD, 360AE, 360AF, 360AG, 360AH, 360AI, 360AJ, 360AK, 360AL, 360AM, 360AN, 360AO, 360AP, 360AQ, 360AR, 360AS, 360AT, 360AU, 360AV, 360AW, 360AX, 360AY, 360AZ, 360BA, 360BB, 360BC, 360BD, 360BE, 360BF, 360BG, 360BH, 360BI, 360BJ, 360BK, 360BL, 360BM, 360BN, 360BO, 360BP, 360BQ, 360BR, 360BS, 360BT, 360BU, 360BV, 360BW, 360BX, 360BY, 360BZ, 360CA, 360CB, 360CC, 360CD, 360CE, 360CF, 360CG, 360CH, 360CI, 360CJ, 360CK, 360CL, 360CM, 360CN, 360CO, 360CP, 360CQ, 360CR, 360CS, 360CT, 360CU, 360CV, 360CW, 360CX, 360CY, 360CZ, 360DA, 360DB, 360DC, 360DD, 360DE, 360DF, 360DG, 360DH, 360DI, 360DJ, 360DK, 360DL, 360DM, 360DN, 360DO, 360DP, 360DQ, 360DR, 360DS, 360DT, 360DU, 360DV, 360DW, 360DX, 360DY, 360DZ, 360EA, 360EB, 360EC, 360ED, 360EE, 360EF, 360EG, 360EH, 360EI, 360EJ, 360EK, 360EL, 360EM, 360EN, 360EO, 360EP, 360EQ, 360ER, 360ES, 360ET, 360EU, 360EV, 360EW, 360EX, 360EY, 360EZ, 360FA, 360FB, 360FC, 360FD, 360FE, 360FF, 360FG, 360FH, 360FI, 360FJ, 360FK, 360FL, 360FM, 360FN, 360FO, 360FP, 360FQ, 360FR, 360FS, 360FT, 360FU, 360FV, 360FW, 360FX, 360FY, 360FZ, 360GA, 360GB, 360GC, 360GD, 360GE, 360GF, 360GG, 360GH, 360GI, 360GJ, 360GK, 360GL, 360GM, 360GN, 360GO, 360GP, 360GQ, 360GR, 360GS, 360GT, 360GU, 360GV, 360GW, 360GX, 360GY, 360GZ, 360HA, 360HB, 360HC, 360HD, 360HE, 360HF, 360HG, 360HH, 360HI, 360HJ, 360HK, 360HL, 360HM, 360HN, 360HO, 360HP, 360HQ, 360HR, 360HS, 360HT, 360HU, 360HV, 360HW, 360HX, 360HY, 360HZ, 360IA, 360IB, 360IC, 360ID, 360IE, 360IF, 360IG, 360IH, 360II, 360IJ, 360IK, 360IL, 360IM, 360IN, 360IO, 360IP, 360IQ, 360IR, 360IS, 360IT, 360IU, 360IV, 360IW, 360IX, 360IY, 360IZ, 360JA, 360JB, 360JC, 360JD, 360JE, 360JF, 360JG, 360JH, 360JI, 360JJ, 360JK, 360JL, 360JM, 360JN, 360JO, 360JP, 360JQ, 360JR, 360JS, 360JT, 360JU, 360JV, 360JW, 360JX, 360JY, 360JZ, 360KA, 360KB, 360KC, 360KD, 360KE, 360KF, 360KG, 360KH, 360KI, 360KJ, 360KK, 360KL, 360KM, 360KN, 360KO, 360KP, 360KQ, 360KR, 360KS, 360KT, 360KU, 360KV, 360KW, 360KX, 360KY, 360KZ, 360LA, 360LB, 360LC, 360LD, 360LE, 360LF, 360LG, 360LH, 360LI, 360LJ, 360LK, 360LL, 360LM, 360LN, 360LO, 360LP, 360LQ, 360LR, 360LS, 360LT, 360LU, 360LV, 360LW, 360LX, 360LY, 360LZ, 360MA, 360MB, 360MC, 360MD, 360ME, 360MF, 360MG, 360MH, 360MI, 360MJ, 360MK, 360ML, 360MM, 360MN, 360MO, 360MP, 360MQ, 360MR, 360MS, 360MT, 360MU, 360MV, 360MW, 360MX, 360MY, 360MZ, 360NA, 360NB, 360NC, 360ND, 360NE, 360NF, 360NG, 360NH, 360NI, 360NJ, 360NK, 360NL, 360NM, 360NN, 360NO, 360NP, 360NQ, 360NR, 360NS, 360NT, 360NU, 360NV, 360NW, 360NX, 360NY, 360NZ, 360OA, 360OB, 360OC, 360OD, 360OE, 360OF, 360OG, 360OH, 360OI, 360OJ, 360OK, 360OL, 360OM, 360ON, 360OO, 360OP, 360OQ, 360OR, 360OS, 360OT, 360OU, 360OV, 360OW, 360OX, 360OY, 360OZ, 360PA, 360PB, 360PC, 360PD, 360PE, 360PF, 360PG, 360PH, 360PI, 360PJ, 360PK, 360PL, 360PM, 360PN, 360PO, 360PP, 360PQ, 360PR, 360PS, 360PT, 360PU, 360PV, 360PW, 360PX, 360PY, 360PZ, 360QA, 360QB, 360QC, 360QD, 360QE, 360QF, 360QG, 360QH, 360QI, 360QJ, 360QK, 360QL, 360QM, 360QN, 360QO, 360QP, 360QQ, 360QR, 360QS, 360QT, 360QU, 360QV, 360QW, 360QX, 360QY, 360QZ, 360RA, 360RB, 360RC, 360RD, 360RE, 360RF, 360RG, 360RH, 360RI, 360RJ, 360RK, 360RL, 360RM, 360RN, 360RO, 360RP, 360RQ, 360RR, 360RS, 360RT, 360RU, 360RV, 360RW, 360RX, 360RY, 360RZ, 360SA, 360SB, 360SC, 360SD, 360SE, 360SF, 360SG, 360SH, 360SI, 360SJ, 360SK, 360SL, 360SM, 360SN, 360SO, 360SP, 360SQ, 360SR, 360SS, 360ST, 360SU, 360SV, 360SW, 360SX, 360SY, 360SZ, 360TA, 360TB, 360TC, 360TD, 360TE, 360TF, 360TG, 360TH, 360TI, 360TJ, 360TK, 360TL, 360TM, 360TN, 360TO, 360TP, 360TQ, 360TR, 360TS, 360TT, 360TU, 360TV, 360TW, 360TX, 360TY, 360TZ, 360UA, 360UB, 360UC, 360UD, 360UE, 360UF, 360UG, 360UH, 360UI, 360UJ, 360UK, 360UL, 360UM, 360UN, 360UO, 360UP, 360UQ, 360UR, 360US, 360UT, 360UU, 360UV, 360UW, 360UX, 360UY, 360UZ, 360VA, 360VB, 360VC, 360VD, 360VE, 360VF, 360VG, 360VH, 360VI, 360VJ, 360VK, 360VL, 360VM, 360VN, 360VO, 360VP, 360VQ, 360VR, 360VS, 360VT, 360VU, 360VV, 360VW, 360VX, 360VY, 360VZ, 360WA, 360WB, 360WC, 360WD, 360WE, 360WF, 360WG, 360WH, 360WI, 360WJ, 360WK, 360WL, 360WM, 360WN, 360WO, 360WP, 360WQ, 360WR, 360WS, 360WT, 360WU, 360WV, 360WW, 360WX, 360WY, 360WZ, 360XA, 360XB, 360XC, 360XD, 360XE, 360XF, 360XG, 360XH, 360XI, 360XJ, 360XK, 360XL, 360XM, 360XN, 360XO, 360XP, 360XQ, 360XR, 360XS, 360XT, 360XU, 360XV, 360XW, 360XX, 360XY, 360XZ, 360YA, 360YB, 360YC, 360YD, 360YE, 360YF, 360YG, 360YH, 360YI, 360YJ, 360YK, 360YL, 360YM, 360YN, 360YO, 360YP, 360YQ, 360YR, 360YS, 360YT, 360YU, 360YV, 360YW, 360YX, 360YY, 360YZ, 360ZA, 360ZB, 360ZC, 360ZD, 360ZE, 360ZF, 360ZG, 360ZH, 360ZI, 360ZJ, 360ZK, 360ZL, 360ZM, 360ZN, 360ZO, 360ZP, 360ZQ, 360ZR, 360ZS, 360ZT, 360ZU, 360ZV, 360ZW, 360ZX, 360ZY, 360ZZ

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• LETTERS

fields of research have benefited from this work, including remote sensing, medical applications, atmospheric physics, aerial photography, and medical research. Such research and many others. Project "Silo" has been named by Col. H. D. Matthews, U.S.N., of the Office of Naval Research, who made the new infrared research tool available to scientists in America and abroad.

I think your readers would be interested too in the available support system. There is a number of research projects being conducted at the University of Minnesota by Dr. E. P. Noy. Dr. John Winkler and Dr. Edward Rohl which has added a great deal to the technology of infrared design and instrumentation. Dr. J. H. Hertz, of the Air Force Cambridge Research Center, named out the development of the infrared tube, therefore making it possible to drive much more powerful and hot as hollow tube. Another example is the Aero Medical Field Laboratory at the University of Minnesota, Center headed by Col. J. P. Shupe (M.D.). Project Officer Maj. David G. Simon (M.D.) was responsible for the development of a portable infrared radiation source for extended (30-minute) flights with aircraft which was the first in future space flight.

Adding to the work of developing remote sensing equipment and other work, Dr. Herman Schaefer of the Naval School of Aeronautics, Dr. Herman Vogel of the National Institute of Health and Dr. Wally Heston of the Naval Personnel Institute of Pathology.

Since its modest beginning in 1947, project atmospheric infrared research has become increasingly more important and is a support to all branches of the Armed Forces and to the Committee for Free Europe. The Office of Naval Research will continue to develop infrared research and its results. The Navy's interest in this field is. Cmdr. Malcolm D. Rose is the Project Officer.

The Cambridge Research Center of the Air Research and Development Command is the center of infrared activity in the Air Force. The Signal Corps has research responsibility for the Army in this field.

In precision, upper atmosphere infrared research represents the concentrated and intense efforts of many scientific working together in the exploration of the mysteries of the earth's atmosphere and the solar system beyond it. It is an exciting field in which they have directed their full attention.

Briefed that it is a strong example of the U. S. Government's remarkable supporting and encouraging research in the field, it reflects the faith of the public and our Government in aerial research and in the scientists behind it who keep our nation far ahead in the field of upper atmosphere research.

ROBERT G. BROWN
Warren Research Inc.
4401 Lyndale Avenue North
Minneapolis 25, Minnesota

where can you match the precision

performance of this new, improved electronic multiplier?



HERE—in a neat nutshell—is what you get in the new, improved GEDA N3A and N3B electronic multipliers: here is unrivaled performance, precision-engineered by Goodyear Aircraft.

★ Guaranteed accuracy over **ENTIRE** range throughout **ALL** FOUR quadrants.

★ Maintains specified accuracy **FOR 30 DAYS** without RECALIBRATION—and it features a new, rapid, simple calibration procedure.

★ New, convenient switching for choice of internal or external reference signals.

★ **AUTOMATIC STABILIZATION** of **ENTIRE MULTIPLIER** against drift and changes in tube characteristics.

★ New, precision components insure **high reliability**. Plug-in, sub-chassis construction for easiest maintenance.

★ **AUTOMATIC INDICATION** to **OPERATOR** of excessive input signals or any malfunction of multiplier.

★ **AUTOMATIC INDICATION** to **MAINTENANCE TECHNICIAN** of individual circuit malfunction.

A Goodyear Engineering Report, GER 4952, is available which describes the principle of operation of the GEDA electronic multiplier. To obtain your copy and a complete description of the GEDA line, address your inquiry to Goodyear Aircraft Corporation, Department 933EL, Akron 15, Ohio.

PS The NEW N3A and N3B are two of more than 32 analog computing units which make up the famed GEDA line. Each unit of the series mounts in either the LS GEDA linear computer or NS GEDA non-linear computer—each unit is completely interchangeable with any other unit, can be used in any quantity, in any combination for the widest flexibility of all electronic differential analyzers on the market today.

GEDA—THE ANALOG COMPUTER MANUFACTURER SINCE 1943



ANALOG COMPUTERS—best way to give your hunch a chance!

GOOD-YEAR AIRCRAFT



NEW-DESIGN **Bendix** OXYGEN REGULATOR MILITARY TYPES MD-1 AND MD-2

Accepted standard for both Bureau of Aeronautics and USAF
• Meets all requirements of MIL-R-25400 • Models for high and low pressures, gaseous and liquid oxygen systems.

Just now going into production is the new high-altitude Bender Type 2894 Automatic Demand Pressure Breathing Oxygen Regulator. It's another advancement resulting from pioneering by Bendix—the world's most experienced manufacturers of oxygen regulators and converter systems. For full details on the new Type 2894, or on other oxygen equipment, write PIONEER-CENTRAL DIVISION, BENDIX AVIATION CORPORATION, INDEPENDENCE, IOWA.

West Coast Office: 117 S. Pasadena, Burbank, Calif.
Japan Sales and Service: Bendix International Division, 251 E. 42nd St., New York 17, N. Y.



Marines Want to Buy New-Type Helicopter

U. S. Marine Corps is seeking two additional types of helicopters to round out its stable of small medevacs and troop transports. The Marines propose to add a type to each end of the helicopter family spectrum with a ocean helicopter on one end and a large cargo "flying crane" helicopter on the other, according to Lt. Col. K. B. McCutcheon, who is attached to the Marine Development Center, Quantico, Va.

Speaking before the American Helicopter Society last week, Lt. Col. McCutcheon said the additional helicopters needed are needed to provide the capability of performing the Marine Corps mission under all conditions.

The logistic requirements particularly call for a high payload vehicle, he said, and added: "We're willing to sacrifice speed to get the capability."

"The cargo helicopter needed next, in effect, be a flying crane."

McCutcheon stated that the Marines will begin their evaluation of the ocean helicopter next summer. At the same time, he said, first delivery will be made of the large Sikorsky HH-3, which has gone into production. By July, he said, the Navy will have completed construction of the first ocean carrier to be assigned exclusively to helicopters.

Further Marine requirements include automatic folding and extension of the helicopter rotor blades and the ability to tow helicopters with rotor blades folded.

Efforts are continuing to improve the ease of maintenance, according to McCutcheon, who said "Helicopter maintenance today is intensive."

Cubana Order

Corpus Cubana de Avianes purchased three V-22s. These amphibious transports, Cubana's order for Vietnam will enable the carrier to match competition in its Caribbean area routes.

The Cuban company is currently operating a fleet of 32 piston engine aircraft.

Delta Sets Record

Delta Air Lines set a new commercial airlines speed record of 1 hr. and 46 min. between Dallas, Tex., and Atlanta, Ga.

The Delta DC-7 broke the previous commercial airline record for the 721-mile non-stop flight which was 1 hr., 51 min. and 10 sec.

BUSINESS FLYING



HELICOPTER'S EXPANDING HORIZON: CHC company sets the sales wing south to drive customers to drilling large oil fields landing area, while Chicago firm employs helicopter as commuter vehicle between office and outlying plants.

Bell Raises Corporate Helicopter Output to Meet Record Demand

By ERIC J. BILMAN

A worldwide trend towards air position use of helicopters for speed, communications, business office and plant is being up a substantial portion of Bell Aircraft Corp.'s total rotor wing production.

The company's helicopter market being Texas Division in V-10 North at ports that 52% of its 1955 helicopter sales have been made to private companies and agencies. A 50% gain over last year's record 18% increase since the 1951 figure. Although Bell does not report helicopter sales in number of aircraft or dollar volume, a source close to the firm estimates that the 14% increase amounts to sales of over 300 commercial aircraft.

In 1955, 20-50% of the commercial helicopter sales went to new customers buying their first helicopter. Domestic demand has increased to the point where it accounts for 60-70% of commercial sales, with the other 30-50% going for export.

Recent Production Plans

Corporate demands for the Model 47 have forced the company to raise production plans against twice the year.

Last month, after it already had committed commercial production for

the first ten months of 1956, the Texas Division had to order production work for an additional 154 commercial helicopters.

"We are guilty of underestimating the market with our somewhat optimistic quantities," a Bell spokesman said, and the sales department now estimates that commercial 47 sales should show a 14% gain during each of the next several years.

There also is an increasing demand in companies who formerly leased their helicopters to buy their own Model 47s. But despite this move, the leasing operation is still an important part of Bell's sales picture with new leases constantly opening up.

47's Ready for Market

The Texas Division says that all three of its current production models are sold out through the first quarter of 1956. Bell also will soon begin taking orders on the latest addition to its line, the new 47B four-engine, high utility helicopter that is scheduled to begin a nationwide sales tour early next year. Orders for the 47B won't be taken until after January, but officials say they could sell half of the company's planned 1956 production of the new model.

The 47B is a low-cost version of the new Bell HUL-1 powered by a 250-hp. Lycoming de-rated to 220 hp

It will be available with several kits, including electric fuel, float, external tanks, cushion tires, range fittings and long-range fuel tanks and pump. It is a revised version of the four-engine prototype 47B that Bell powered on a 10,000-mph endurance test. Design changes include larger rotor blades and longer landing gear.

Approximate prices on Bell's three-place current models 47C, \$39,750; 47D, 1 (250 hp) Lycoming de-rated to 208 hp, \$41,800; 47B, \$47,500 (with de-rated engine). No price has been announced for the 47B.

There are over 300 commercial Model 47s now in service in the U. S. and abroad more than 100 other units combined. Many features and design improvements have steadily increased the time spent between major overhauls. When the company sold its first ever non-military Model 47 in 1946, manufacturers expected between overhauls was only 25 hr. now it is 600 hr.

Skimmer Amphibian Goes Into Production

Model has been set for the initial production run of 10 three-place C-1 Skimmer amphibians at Colonial Aircraft Corp.'s new Sanford, Me., plant. Delivery of the first airplane is scheduled for May, according to David B. Thomas, Colonial president.

Formerly located at Deer Park, L. I., N. Y., the company currently has 21 amphibians but plans to increase the payroll to 60 by May 1 and 120 by a November. Production of eight Skimmer



AT G-E FLIGHT TEST CENTER, SCHENECTADY, N.Y., engine tests are conducted in special Mark II-42 Fryer test bed, a new prototype powerplant for the installed in both big white B-42 test airplanes record, world's in performance.

G.E. Steps Up The Pace of Advanced Jet Engine Development



Teamwork with ARDC, coupled with new private investment, sets stage for significant steps forward in powerplants

At research, development, and test centers across the United States, thousands of American engineers are tackling the problem of keeping the nation first in air power. The job is of vital importance. For today we know that quantitative air superiority is not enough. Needed also is qualitative superiority.

USAF's Air Research and Development Command directs the Air Force's air-side drive. And in one important field—aircraft powerplants—close co-operation between ARDC and engine manufacturers is now making possible new progress toward advanced engines for tomorrow's aircraft.

As a member of the National Defense team, General Electric is constantly working to cut the time needed to develop new powerplants. To step up progress on jet development, G.E. is now using the demonstrator engine concept. The demonstrator idea, by separating production

considerations from development, has allowed rapid improvements in engine components and materials, radical design advances... cut new engine development time a year or more.

But as jet engines grow more powerful, so too grow development facility requirements. The investment of private capital in new facilities makes possible development progress which otherwise could not be accomplished. Near Cincinnati, for example, G.E.'s multi-million dollar investment in component development facilities—staffed and equipped for research on all types of engines—is doing much to advance the state of engine art.

Adequate national air power calls for close co-operation between industry, the Armed Services and other government agencies. In this partnership lies the best assurance of America's future leadership in the air.

Progress Is Our Most Important Product

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NEW PRIVATELY-OWNED FACILITIES such as G.E.'s advanced development facilities near Cincinnati, help G.E. technicians probe future phases of powerplant research.



LONG-RANGE ENGINE DESIGN STUDIES at G.E. result in new advanced powerplants. Development work is currently being carried on for powerplants of 1950's and beyond.



New ROTOCHUTE for Pinpoint Drops

Working with the Office of Naval Research, Kaman Aircraft is developing a new concept of air supply for confined combat areas. The Rotochute will permit the dropping of supplies from low-flying high-speed aircraft into restricted areas with pinpoint precision. Supply planes will fly under the range of automatic fire at jet speeds. Delivering supplies will be left to "brandy memory." The Rotochute is another example of the advanced research and development programs being carried out by Kaman in the National Defense effort.



main monthly is scheduled for January 1977. After the initial 10 airplanes, out put will be geared to blocks of 20 airplanes. Negotiations are under way with approximately a dozen distributors, Thomson said. He expects to establish Skatex franchises in South and Central America and Canada by the end of this year. Recent data developed for the engine, which is powered by a greater 150 hp Lycoming engine show a 14,000-ft service ceiling at 2,000-lb gross weight, an level rate of climb with thrust loading gear retracted and flaps down of 500 fpm, level takeoff run of 715 ft and water take off time of 25 sec.

PRIVATE LINES

Some 110 business planes landed at San Francisco airport heading directly to the recent four-day American Petroleum Institute meeting in that city. Normal private-aircraft traffic at the field is 15-20 planes daily.

Completely visual wind solution is provided by a new pocket-size no navigation computer that also automatically provides lateral or horizontal component, air force and degree of any crab angle. True compass indication takes into account possible error in plane's outside temperature indicator readings due to heat from skin friction and wind-pneumatic. New model R-3 computer is available from Jeppesen & Co.

Sturgeon, A-100, D-5, C-5, C-130, for 40 in diameter version, 56-70, in each diameter 59.85.

Donors of a Cessna 172 has been made to California State Department of Education by Larry Hest, president, Air Class Co., Long Beach and Torrance, is and in promoting aviation education.

Lowest takeoff weight increase to 24,000 lb from 22,500 lb has been approved by Gulf Aerospace Authority. Landing weight has also been upped to 21,900 lb from 20,400. Modifications to permit higher weights include strengthening main landing gear assemblies landing gear and spin which joints and outer wing panel attach points. Last Aircraft Engineering Division Santa Monica, Calif., is modifying other Learjets to handle the higher weights.

New address of Dore Aviation Co. is Columbia Airport, Route 2, W. Columbia, S. C. The sales and service organization formerly was located at Green Field.

Executive DC-3 has been delivered to President Gustavo Rojas Pinilla of Colombia by Aerospace Aviation Services Co., Los Angeles, Calif. President's question includes a complete short range radio communications setup. Power plants are P-3W R-1510-9-46 of 1,310 each. Evening News Publishing Co., Durham, N.C. has purchased an 11 place Learjet executive transport.



Seven Seas by Douglas: worlds of warmth by Janitrol

Flying 62 passengers 5000 miles non-stop at 350 mph, the "Seven Seas" is the long-range version of the dependable DC-7, and Janitrol again provides air-circulating and cabin heating. Four Janitrol S-300 heaters—one in each wing, one under the cabin deck, and one in the cargo compartment—each produces 300,000 Btu per hour. Wing units circulate hot air through the leading edges, and the tail unit keeps ice from forming on cargo-compartment leading edges. Passengers and crew are warmed by both radiant wall and floor heat and circulating warm air, kept at 70°F regardless of outside temperature.

The Janitrol line of heaters spans all industry, commercial and military aircraft requirements. Call your nearest Janitrol representative.

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Cessna Delivers Tricycle 172

Aimed at making flying simpler for the businessman who pilots his own plane, the new Cessna 172 is the company's newest four-cylinder, four-cylinder landing gear. Powered by a 145-hp Continental, the all-new 172 sells for \$4,750 list. Wichita's Cessna began deliveries of the new model in mid-November. Landing gear landing gear will remain as soon as plane's weight comes off the wheels and also control in the air, even when rubber is applied, to keep drag to a minimum. Geometry of the landing gear is such that the plane maintains a low center of gravity for easy maneuverability. On the ground the nose wheel is shrouded with rubber 10 deg. on either side and stabilizable using brakes to 30 deg. either side. Cruise speed of the 172 is over 130 mph and range is 415 hr. By retaining the passenger seats, even a quarter ton at cruise can be carried. Each of the doors is 16-in. wide.

a *new* wire wound potentiometer



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"density" means serious cooling problem, according to Al Wenzel, head of Baker's Navigation Aids Branch. Wenzel also pointed out that even aircraft landing systems require equipment to a high-G shock which can hit 250 impacts.

Despite these specialized requirements, J. G. McElroy, assistant head of research and development for Collins Radio, sees little fundamental difference in design requirements between defense and military aircraft equipment. "Basically, Collins' George Church noted that the design of aircraft equipment is a series of compromises."

Buying to Specifications

Space observers suspect that at least a portion of the immediate problems now encountered in military aircraft equipment is attributable to the fact that many of "procurement by specification" instead of making some use of the competitive forces which govern commercial buying.

Considering the fact that the military spends an average of twice the initial equipment cost over years in maintenance, and the fact that it is

difficult to get equipment reliability into specification lists, those observers believe that present procurement practices may be "pretty wise and sound indeed."

Although there are some secret indications that military buying practices are moving in the direction of commercial practices, the safeguards which Congress erects upon for military procurement make it appear doubtful that the pendulum can swing all the way.

To Lowest Qualified Bidder

When a new military device or equipment has been developed, the initial procurement usually goes to the firm which made the development. Subsequent procurements are then made on a competitive bid basis, with the lowest qualified bidder getting the job. Although a firm's past performance on a number of contracts for a variety of aircraft equipment is a factor in determining whether the company is "qualified," only the original developer has had any production experience with the specific item under procurement.

If the second procurement goes to a

new contractor, frequently the company goes through the same "learning curve" in the second production. Sometimes, but not always, the same troubles which plagued the original equipment, or entirely new ones, crop up in the second procurement equipment. The worry is that there is a lot of production know-how that can not be put on blueprints in a specification.

If there is a third procurement and it goes to a new supplier, the whole cycle can be repeated. The delays which the Government saves in initial equipment costs may be more than offset in increased field maintenance costs.

However, such is not always the case. Sometimes a new supplier carries significant experience and know-how over the original equipment.

Airlines Buy Differently

Competition and commercial buying practices are an important factor behind the greater reliability of airline aircraft equipment. William Carson of Armstrong Radio, Inc., told the Baltimore newspaper.

For example, if Company "X" gets



How's the Weather at 80,000 Ft.?

That's what the Signal Corps hopes to find out by launching this signal over balloons from Ft. Monmouth, N. J. "Expos" balloons are used to check how far out a standard sphere. Under the balloon is a pendulum attached to a radio which finds weather data at seven (radio wave) meters at 100. Chute hangs sideways to catch after balloon bursts at 70,000-80,000 ft.





"Piasecki offers an exciting challenge... An unusual opportunity in a new field of aviation."

says George Piasecki, Staff Secret Engineer.

"They have superb facilities, plus an engineering staff of the highest caliber," he comments, "and their focus is on today's military and commercial aircraft research programs. Also, the ideal suburban Philadelphia living is just out on Piasecki."

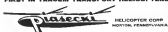
There are just some of the many benefits you'll find as a member of Piasecki's engineering staff. Great things are happening in helicopter development... big things—enough to warrant a steady growth to those who look to the future. There is stability and advancement in this exciting, challenging new field of aviation.

Investigate these job categories. There may be a place for you in the rapidly-expanding, fast-growing Piasecki organization:

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an initial order for a new type aircraft, it leaves that aspect orders from that initial order, and orders from other orders, depend on long reaction upon the reputation (both performance and reliability) which the equipment picks up.

If the set proves extremely dependable, Company X can be pretty certain of getting subsequent orders, without fear that an "unknown" in the field might cause with a slight lower price and using the business.

This does not mean that the airlines are not interested in cost. However, they recognize that maintenance costs quickly exceed the original equipment cost.

While it is difficult quantitatively to measure or define these intangibles, an airline operation is small and close knit enough to enable its engineering department and purchasing agent to factor such important considerations into their buying decisions.

Step in Right Direction

The recently announced policy of USAF's Air Materiel Command to possible contractors for poor performance and late delivery (AW Sept. 19, p. 12) was called "a double-edged sword" in my second business transaction and was which the airlines consider in buying equipment," by Collier Radner's McElroy. Collier is a major supplier of both civil and military aviation.

"We believe," McElroy said, "that industry can and should do more in the role of supplying the military with equipment based on the same rules and procedures that govern commercial business transactions. Industry should be given the opportunity and actively encouraged to develop equipment to which military requirements, being the most demanding, are added to specifications largely by industry."

In announcing the new AMC policy, Mr. Gen. David H. Baker, Director of Procurement and Production, said: "In anticipation we will look carefully for industries that contractors are willing to accept normal business risk and better responsibility for products developed and produced."

Give Industry Free Hand

Where evidence exists that industry is willing to develop equipment on its own to meet military needs, McElroy called on the military to "release from existing contracting programs." McElroy also called for "a just means of providing industry with compensation for proprietary items." If such a plan is established and adhered to there would be an end to the government push-back McElroy said.

The military "must find ways of removing industry's freedom and does

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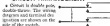
It is one of a new family of MICRO SWITCH environment proof switches which offers aircraft designers unusual flexibility in switches whose elements are completely sealed from effects of atmospheric changes.

The "EM-4" shown here is composed of two single-pole, double-throwing units completely sealed in a housing filled with inert gas under pressure. Six 28 gauge MIL-W-8896 leads, six feet long, are supplied, one from each terminal. These project at a 90-degree angle from the base of the switch. They may be run in any direction by rotating the switch.

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Mobile High-Power Radar

High power search radar, the AN/SPS-10, and all its supporting equipment can be transported in one truck and two trailers and erected in less than three hours. Set was developed by General Electric and Bunker Air Development Center for use by Task Force Air Command and the Marine Corps.

of these future planning," McElroy said. Security barriers should not deprive the industry of industry's technological power. Accidents in the development of the AN/SPS-10, p. 12) were called "a very encouraging step" by McElroy.

Economic security may finally meet the security of defense with the point where little difference will exist in defense's various equipment, he said. Army, Navy, Air Force and Marines' McElroy concluded.

Avionic Firms Expand

Collins Radio Co., Cedar Rapids, Iowa, has acquired 100% ownership of Communication Accessories Co., Hickman, Mo., maker of transmitters, magnetic amplifiers, and audio band-pass filters. The new subsidiary will continue to operate as an independent unit under E. J. King, Jr., founder and president.

Collins recent expansion within the avionic industry include:

- Litton Industries' Power Tube Division, San Carlos, Calif., will now begin construction of a new 40,000 sq ft building, increasing the division's facilities to 100,000 sq ft.
- The Ruess-Woodbridge Corp., Los Angeles, has acquired 44 acres of land at the International Airport district, approximately 14 miles from the firm's present site. Company intends eventually to transfer its research activities to the new location.

quality to transfer its research activities to the new location.

- Weber Aircraft Corp., Burbank, Calif., has established a new electronics division, under James H. Davis, with John T. Kern as chief sales engineer.
- Fossan, Felsch, & Miller, Inc., Los Angeles, is aware of new company formed to develop and manufacture avionics equipment for aircraft and missiles. Donald M. Fossan is president, Robert N. Miller is vice president, and Jack R. Felsch is secretary-treasurer. Company occupies a 12,000 sq ft plant at 12320 Vanowen St.

• Electrical Testing Laboratories, New York City, has added a new 5,000 sq ft electronics lab to permit testing and engineering services from into the company's existing 10,000 sq ft lab.

- Company has acquired a new 5,000 sq ft electronics lab to permit testing and engineering services from into the company's existing 10,000 sq ft lab.
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• Raytheon Manufacturing Co., has opened a new 225,000 sq ft electronics lab at Weymouth, Mass. New lab will house approximately 1,500 employees, consolidating activities carried out at seven separate locations.

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to stretch America's Air Arm
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Almost daily, continuous flights halfway around the World are being made because four KC-97 tankers meet bombers for refueling in mid-air. Tankers like the Boeing KC-135 will bring "targets" on faraway Continents within striking distance. The new Boeing KC-135 will hold twice large cargoes because added strength with less weight is possible with metal honeycomb construction. Kawneer is helping build these planes like the KC-135 faster because of excellent metal bonding facilities to produce any kind of honeycomb assembly. Our experience in metal bonding honeycombs will be helpful to you in designing new applications of this material. This is another example of how you can benefit by Kawneer's integrated engineering and manufacturing service.

Kawneer will produce the structure for the KC-135 utilizing honeycombs sandwich construction

Illustrated here is the Boeing KC-135 tanker/transport prototype of the new KC-135.



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Expandable Skid Brakes Lighten Vulcan Bomber Undercarriage

London—Conventional wheel braking on one of Britain's Avon Vulcan V bombers has been replaced by the use of two retractable skids lined with expandable sole which operate in the runway surface.

This revolutionary braking system was developed by Dorn Equipment Ltd., of Chichester, which made the liquid expand gas in the Vulcan.

The dash on board between the two skids will pump, on each leg, and when extended let fluid into the side beams. When braking, both pads are inflated, built-in forced into the runway and pressed to take up to 90% of the vertical reaction for the maximum braking condition. The weight distribution, between skids and pad is automatically maintained during a landing by a sensing element operating on the deflection of the skid.

Between the Wheels

Twenty percent of the weight has to be left on the skids as a measure for dynamic stability, making the aircraft to respond satisfactorily to any wheel steering. Each pad is designed as a small beam, with shiftable, easily replaceable, synthetic rubber sole. A mean braking coefficient of 0.35 has been achieved.

Further advantage of the system is the structural one of dispensing with the skids needed to form a heat sink in the brake system of jet bombers. Their weight was essential to avoid localized periods. Dorn claims a 15% reduction in aircraft structural weight is achieved. Taking the weight of a large undercarriage at about 4% of the aircraft structural weight this implies that Dorn's has reduced the weight of the bomber's undercarriage still by as much as 25%.

Other advantages of the system: reduction of tire heat, as skids are involved in braking longer, improved braking on wet and icy runways due to sensing action of the specially profiled rubber sole.

Skid Design

The pattern of the skid pad is fixed to the side beam within which the cylinder telescopes. In this way the pads meet in the side's design, the only other connections being the tongue leading to the foot to transfer the reaction of the skid and deflected landing complex into the main structure.

At the foot of a retractable pad, so that 90% of the aircraft weight will not be carried on two "rigid" columns of oil, a pneumatic capsule is incorporated in the cylinder. A long stroke pad is needed to compensate for tire deflection and wear of the pad.

Operation is by hot motion and electrohydraulic valves. Full brake can be selected in the air and is thus applied automatically as soon as springing up is completed.

Pad Design

Most of the development consisted in the choice of material for the pad. All

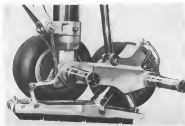
the materials tried got too hot and deformed too fast on coefficient. They also introduced an element of stopping weight and tended to damage the runway. Choice of the correct low-cost proved insignificant.

Most non-metallic materials tried had insufficient life or strength. Such a special synthetic rubber showed up with the necessary low coefficient of heat conduction, high coefficient of friction, hard enough to avoid tearing and yet flexible enough to give to surface defects. The specification of the synthetic rubber could not be closely controlled. Vibration rubbing could not be used as this caused thermal overheating of the pad. The development, eventually, was carried out in visible corrected spots on.

The sole is made up of three rubber



SKID RETRACTOR—View of hinge beam with one wheel pad retracted to show detail.



SKID EXTENDED—Large long-stroke pad forces rubber sole foot onto runway.

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pads which are chemically bonded to bearing plates. These are located in the foot by tension struts and secured with quick release attachments at the toe. Reinforcing braces in the pads ensure that slush, material or surface water escape by the quickest route and do not act as lubricant across the length of the foot. Energy absorbed by the pad is

proportional to the rubber sheared and it appears that each sole has a life of several loadings.

Long-Life Battery Adopted for S-59

The Yardsman S-59 helicopter has been adopted as signal equipment on the new Sikorsky S-60 gas turbine-powered helicopter, according to Emerson Electric Corp., New York.

The battery was chosen after a series of rapid comparative tests and evaluations, the company says, in which the S-59's light weight and long life topped the series.

The Yardsman battery chosen for the S-59 weighs 26 lb., compared with 44 lb. for a conventional type lead-acid aircraft battery. According to Yardsman, the lead-acid unit had a capacity of 34 amp hr., a life of about three days, and was able to start the turbine only once every twelve hours.

The S-59 unit has been in service on the XH-19, military version of the S-59, under identical conditions for more than 15 months without any maintenance or servicing and has given more than 500 starts without a failure.

It is rated at 46 amp-hr. and has a normal capacity of 24 volts.



Pitots for B-52 Thrust Measurement

Arrows point to pitot heads built into an intake of the J57 turbojet installed on a Boeing B-52. The pitot heads engine intake air pressure for the plane's jet engines; ratio indicated (AW Apr. 25, p. 68) which means jet thrust by comparing static and engine exhaust pressures. Used for the instrument because proportional with the development of two-point targets: where a small change in compressive speed can result in large thrust variations even in angularly static engines. This inlet not necessarily thrust-measuring system built on gas and intake target. Being engineers' tool, modified such meters as pressure ratio indicator on prototype B-52 flight tests. Orders for the production instrument (three were subcontracted to Minneapolis-Honeywell Regulator Co. and Allentown Manufacturing Co.

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WHO'S WHERE

(Continued from page 9)

W. E. Smith, formerly with General Aircraft Co., has joined Ford Engineering & Service Division, Aircraft Sales Corp., Broomfield, N. J., to handle sales and engineering of military products.

C. Rex Smith, aviation sales manager, Avco Corporation, Avco Division of U. S. Industries, Inc., Los Angeles, Calif., covering expanded line of aircraft sales.

Samuel Elms, Bristol Aeroplane Co., Ltd., test pilot, has joined the sales department of Bristol Aircraft, Ltd., a new subsidiary.

Richard E. Proberts, sales engineering staff, Wyler Aircraft Corp., Burbank, Calif.
W. Ross Hyatt, Jr., manager, General Electric Co., Syracuse, N. Y., in charge of cyclotron gas tube manufacturing, Radio A. Kolls, sales manager, outside any sales with department.

Leslie Van Camp, general manager, Messers Manufacturing Co., Burbank, Calif. Other appointments: **Ernest A. Scott**, research assistant, secretary, Elmer D. Black, works manager, **George B. Phillips**, technical relations manager, **William K. Brown**, production planning manager and **Walter M. Kuf**, quality control manager.

Dr. H. Gerhard Stieve, former USAP chief general, aerospace division, School of Engineering, Massachusetts Institute of Technology.

Vernon McCannell, custom design passenger sales manager, Air Flight.

John E. Smith, chief engineering applications, Patten & Brunsfield, Princeton, Ind.
Dr. Wladimir A. Lashin, research assistant to the manager, research branch, Research & Development Division, Carbondale Co., Niagara Falls, N. Y.

H. F. Franklin, general sales manager, Ford Instrument Co., Inc., Manhattan, N. Y.

Fred L. Roberts, advertising and publicity manager, Motorola Division, Aerial Instruments, Inc., N. Y.

Alphonse J. Gaffin, control administration, National Co. Inc., Madison, Mass.

C. L. Dorn, planning manager, Aeronautics Division, Massachusetts General Hospital, Boston Co., formerly deputy director of procurement and production, Air Materiel Group, Europe.

Reg. Geo. William A. Wrenthall (USMC ret.), assistant to director of applied physics laboratory, Johns Hopkins University, Silver Spring, Md., formerly head of air conditioning office of Naval Engineering.

Norman J. Ayden, former research engineer in Office of Naval Research, administrative for research and preliminary design, Private Helicopter Corp., Madison, Pa.

William F. Amodeo has been transferred to Toyworld Co.'s research sales division, technical liaison, with headquarters in Santa Ana, Calif.

Dr. A. M. Zarem, engaged as assistant director manager, Southern California Division, Stanford Research Institute, to open a private consulting practice at 727 W. 5th St., Los Angeles, Calif.

Scott C. Whelan, director of regulatory proceedings, Procter & Gamble.

Joseph W. Powers, assistant chief executive, General, Inc., Los Angeles, Calif.

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Continental Buys Jets for New Routes

Four Boeing 707s, 12 Viscounts, five DC-7Bs ordered as western carrier maps plans for services.

By Craig Lewis

Denver—Continental Air Lines moved quickly last week to establish itself as a major competitor on its new western routes with a \$16 million purchase program for turboprop, turboprop and piston equipment.

Continental has ordered Boeing 707, Vickers Viscount and Douglas DC-7B aircraft to serve the new Chicago Kansas City-Denver-Los Angeles routes awarded last month in the Denver service case (AW Nov. 21, p. 99).

The new equipment program will give Continental a fleet of aircraft which will be competitive with those of American Airlines, United Air Lines and Trans World Airlines, the three eastern Continental must compete with for business on the routes between Chicago and Los Angeles.

The \$21,300,000 order for four Boeing 707 turboprop transports will give the regional airline top service between Chicago, Kansas City, Denver and Los Angeles at least three months in advance of any other airline, according to Robert F. Siv, president of Continental. Delivery of the 707 is scheduled to start in May 1959, and service on Aug. 1 of that year.

Delivery Schedule

The Boeing 707, which will be produced by the Pratt & Whitney J57 turbojet, will set its full current operating hours between points on Continental's new route. It will carry 116 passengers and 7,000 lb. of mail and cargo and will have a range of 1,000 miles.

Continental's \$18,000,000 order with Vickers is for 12 Viscount 610D turboprop transports. The 33-passenger Viscounts are scheduled for delivery between March and September 1958, and will be used on present Kansas and DC-3 routes as well as on the new east-west routes. Service is scheduled for July 1958.

The Viscount will be powered originally with the Rolls-Royce RDS 7/7 Dart engine rated at 1,100 hp. and producing a cruising speed of 365 mph. Within a year, these engines will be replaced with the RDS 8 Dart engine with 1,500 hp., giving the airplane an ultimate cruising speed of 400 mph.

The Douglas order for five DC-7Bs

replaces a previous order for DC-6Bs and is scheduled for delivery in March 1957. These will be placed in service on the new routes in April carrying 64 first class passengers or 94 club passengers.

New Markets

Continental considers the DC-7B a transitional aircraft and looks forward to an all-turbine operation over all but its shortest routes. The Douglas transports have been ordered to fill equipment needs in the period before turbine equipment is delivered.

Earlier this year, the airline ordered three Convair 440 Monomountain transports which will be delivered next March. Currently, Continental has five DC-6Bs, including two on lease, on Denver 50th and 21 DC-3s. Delivery of the new Convair will allow the carrier to dispose of part of its DC-3 fleet.

Continental's new routes add only 1,200 miles to the carrier's present 5,000 mile system, but they nearly triple the population market Continental will be able to tap. With these new markets come inevitable problems in converting from an essentially short-range operation to one which involves long, high density routes.

Continental's present routes, recently augmented by acquisition of Pioneer

Air Lines, service has been handled by Denver, Kansas City, Tulsa, Dallas, Houston, San Antonio and El Paso. The airline of the system and its first 10 short-haul routes, though, will carry a short-range type of operation with DC-3 and Convair 440 equipment.

Interchangeable Service

Want to run regional airlines cheap, cheap, cheap, is not so. DC-6Bs will emerge with maximum range. Term in this, West Coast and with United States (and also down to Pacific which connects the system with service in the Pacific West and West Coast). The fact that both Continental and American have ordered the 707 will facilitate further development of interchangeability. A Convair interchange is operated with Buell between Denver and St. Louis.

The regional character of Continental's system has inhibited development of aircraft service, more than a few weeks with enough range and traffic density to make such service profitable. No decision on the use of the 707 in such service has been made by the airline, but the DC-7B will be operated as a check-in well as first class aircraft. As the Viscount and later the 707 go into service, the DC-7B can be shifted to all coach operation.

Selection of the Viscount over the Lockheed Electra is a good indication of Continental's plans for its present routes. The Vickers transport fits in



VICKERS VISCOUNT turboprop transport model with markings of Continental Air Lines.

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DALLAS, TEXAS

RDA 8 for Viscount

The Viscount 810D will be added to the Viscount 810 after the RDA 8 engines are installed. The Red Bull engines will be changed to 1,800 shp by the late 1990s, according to Charles Gaudin of Vertol-Aerostar Ltd. Since the RDA 8's maximum is 2,500 shp, Vertol claims that 100% horsepower reserve is assured for the engine. In addition, the Viscount which Continental will receive will be of better construction than the Model 800 which British European Airways will operate over European routes beginning only in 1997.

letter is a replacement for the Conquest and a partial replacement for the DC 13 than the larger Electra. Six, told Aviation Week, Continental's smallest aircraft will replace the Conquest, a replacement of 17 DC 13 will be an enhanced DC 13 replacement in development.

Service Problems

Problems involved in expanding its operations to include the new Chicago-Los Angeles route will probably keep Continental from inaugurating service before winter. One problem is equipment for the period before the DC 13 is delivered. The carrier will be able to work some DC 68 aircraft out of its interchange program to start the new route.

A bigger problem is establishment of

Continental in both Chicago and Los Angeles. Ticket and operating facilities must be built at both points, and space is a critical problem. In addition, the airline plans to set up maintenance facilities at Los Angeles. These would be required to establish these facilities will probably delay the start of service about six months after the January date, according to the Civil Aeronautics Board.

Once service is started, Continental has another major problem in establishing its identification in both cities. Some differentiation exists in Los Angeles because of interchange operations, but the airline plans a major promotional campaign to put itself before the public as a competitor on the newly awarded route.

Promotion Plan

Pratt plan call for a major salesperson in Los Angeles and Chicago, but in both cities, television and billboard advertising and a direct mail campaign. In only a month, this program will take off in a series of comprehensive advertising schedule.

Continental will also have advertising in the major airline cities it figures will generate through traffic, but most of its efforts will be concentrated in the immediate markets served. The carrier figures it can offer a better set of schedules for all points on the new route than its bigger competitors who have to serve about 10 intermediate markets. It also plans to sell an individual, personalized type of service which Continental feels is characteristic of a smaller carrier and which it stands

to provide when operations are up-and-running.

Continental figures that business will more than double in the next five years from the new routes and expansion of present services. This year, the carrier will make about \$15 million. Traffic and revenue have tripled in the past few years, including a 50% increase from the merger with Pioneer last spring.

Traffic Gains

Figures for the first nine months of this year show an increase of \$11.7 million compared with \$9.0 million for the same period of 1993. Not because the year was \$231,045, down from \$372,111 for the same month period last year.

The reduction is attributed largely to expense involved in the acquisition of Pioneer Air Lines which was merged with Continental's operations April 1, 1994.

Traffic showed substantial gains in the period. Domestic passenger-travelled increased from 321.9 million in 1994 to 183.6 million in 1995. Cargo traffic rose a 10% gain to 19.5 million tonnes, reflecting development of the cargo market, particularly in air cargo which reflects transportation is inadequate due to mountainous terrain.

Along with plans for expansion of its route network, Continental is also dealing with Denver airport authorities for space for a new baggage facility. The project will cost \$1 million and will include maintenance and office space in a plant expansion designed as part of the general Denver airport program

Minetti Replaces Lee on CAB; Rizley Expected to Resign Soon

Washington—G. Joseph Minetti, a New York Democrat, has been named by President Bush to succeed Josh Lee as a member of the Civil Aeronautics Board. Minetti's appointment becomes effective when Lee's second seven-term expires Dec. 31.

Minetti, 48, is now a member of the Federal Maritime Board to which he was appointed by the President in April 1994. He previously had been Commissioner of the Department of Marine and Aviation and Commissioner of the Board of Transportation of New York City. Minetti is a member of the law firm of Denton, DeLoach and Minetti of New York.

Failure to reappoint former Sen. Josh Lee, an Oklahoma Democrat, was not unexpected in industry and Congressional circles. Lee lost his chance of reappointment on the Board since Republican Sen. Rick Warren, the senior senator from Oklahoma in February (AW July 18, p. 11). Failure of the Bush administration has been not to reappoint Democratic senators to independent agency posts.

Lee's departure from CAB along with Rubin's expected resignation to accept a Federal Aviation Board seat to a complete realignment of CAB was expected. The surprise has occurred of Rubin, Lee and Vice Chairman Joseph A. Rubin, a former FAA administrator, has been not to reappoint Democratic senators to independent agency posts.

Departure of Lee and the choice of Minetti as his replacement immediately drew criticism. Sen. Mike Mansueti (D-Idaho) who is chairman of the Senate Commerce Committee's



G. JOSEPH MINETTI

aviation subcommittee, has accused Secretary of Commerce Stanley E. Davis and Under Secretary Louis S. Rothchild of undermining a Commerce Department plan to seek control of aviation.

Sen. Minetti and the support team of Josh Lee was blocked "not because he is a Democrat who moved under Truman, and second because Rothchild would be badly hurt by Minetti's Commission. G. Joseph Minetti of Brooklyn supported to the long-term of the Committee Department and not much out to further cabinet members."

Although Minetti expected great success over Josh Lee's term "one-sided" he was more interested over the fact Glushko is a supporter going in line in opposition to the CAB. Minetti said "They are not looking for out to a Democrat" but they will be in another Republican seat (Rubin's seat).

Braniff Orders Nine Lockheed Electras

Braniff International Airways had just announced its third aircraft order of the year: nine turboprop Lockheed Electra transports with delivery beginning in May, 1999.

The order, made two weeks to the day after Braniff's order for Boeing 707 jetliners (AW Dec. 5, p. 127) reported that the Electra is powered by Allison T56 turboprop engines. Cost of the Electra's jet engine and parts will be \$22 million.

Braniff, which also ordered seven

Douglas DC7Cs, that year, because the third U.S. airline to order the Electra (American Airlines had ordered 35, Eastern, 41) it will place the 400 mph transport in both domestic and international schedules, including the month-around Southwest Airlines and Washington-New York routes (AW Nov. 25, p. 121).

A Braniff spokesman said the Electra will cut time on Omaha-Minneapolis flights by 24 min., Dallas-Houston by 17 min., and Kansas City-Salt Lake by 15 min.

Minimum operating altitude of the Electra will be 30,000 ft. Only a gross takeoff weight of 138,000 lb. it will be qualified to operate from runways of only 4,500 ft.

Seating capacity of Braniff's Electra will be 50 in the first-class configuration, up to 91 in the tourist configuration, and 75 in the combination coach-first-class arrangement.

P.O. Airmail Test Upheld by Court

Post Office Department's experiment of flying first-class airmail mail is upheld by the U.S. Court of Appeals.

The decision provides for a continuation of the experimental program and reverses a District Court order, granted at the behest of the Aircraft Owners and Pilots Association, to order mailmen not to load first-class mail on passenger aircraft.

The unanimous decision of the three-member Circuit Court concluded that "the experimental program for carrying airmail first-class mail by air within the current authority of the Postmaster General is authorized by law."

An immediate expression of the law suit by the program is now expected by the scheduled airline industry. The experimental program, which was inaugurated on Oct. 5, 1995 with service between Chicago, New York, and Washington, today covers more than 280 airline routes, has speeded deliveries from 22 to 24 hours and resulted in substantial savings to the Post Office Department. The airlines have agreed since that \$25 million for the savings of reduce cost at rates increasing less than 50% of the annual compensation rates.

Damon Predicts Gains

Ralph S. Damon, president of Trans World Airports, predicts the heaviest airline traffic in history in 1995. He said TWA expects to be four and a half million passengers in 1995 which will be an increase of 15% over the estimated 4 million passengers the airline carried this year.



Fairchild to Build Fokker Friendship

Fairchild Engine and Airplane Corp. announced last week it will begin construction of Fokker F27 Friendship turboprop aircraft for North American order agreement with U.S. Boeing. Fairchild plans to begin delivery of the 40-passenger, twin-engine turboprop in 1995. West Coast Airlines has no option for Fokker F27s.

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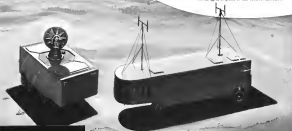
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ICAO Will Spend \$1.14 Million In 1956 Technical Aid Program

Technical civil aviation assistance will be furnished in 27 countries and two regional areas, Latin America and the Middle East, by the International Civil Aviation Organization during 1956 at a cost of \$1,146,793.

The program includes training of air controllers, meteorologists, navigators and other technical personnel necessary for the operation of a civil aviation organization. ICAO noted that aviation offers very specific transport in return for a much lower capital outlay than is necessary for the construction of roads and other surface means of transportation.

In less developed countries, nationals are trained in their own countries where the number requiring instruction is large. Fellowships have been granted to permit study in advanced nations.

The 1956 regional program includes: • **Middle East:** Services will be expanded in this project where the training will be carried out at several small ICAO centers. Technical personnel include experts in personnel licensing and training, aircraft maintenance and certification, and check pilot examinations. This will help Middle East states, which have similar aviation problems, to improve their training methods and standards for licensing personnel. Fire, lighting and rescue training in structures also will be given.

• **Latin America:** An aviation training center established by ICAO and Mexico in 1953 is being converted into a regional center for all Latin America.

ICAO estimates that the new center will supply about one-half the requirements in this region for well-trained personnel during the next two years. The center has already graduated more than 200 mechanics, air traffic controllers, aeromedical inspectors and radio operators.

Typical of the program is individual contracts on these projects:

- **Algeria:** Continuing advice will be given in radio operations and repair, meteorology and airport management. Algeria has purchased considerable equipment and aid will be given to its controllers and operations. Airport construction assistance is also scheduled. The ICAO program civil aviation aid program started in 1952.
- **Ethiopia:** ICAO will continue to operate a school for aircraft and engine mechanics, radio operators and maintenance personnel, air traffic controllers and meteorologists. The school has already graduated 281 technicians, but the rapid development of aviation in Ethiopia requires more personnel.

• **Lebanon:** Emphasis in 1956 will be on improvement of air traffic services, communications and meteorology. Six fellowships are provided for Lebanese recruits.

• **Senegal:** The program will be broadened to aid in the construction of pilots, provide advice on aircraft inspection and the organization and administration of Senegal aviation.

Other programs will be conducted in Egypt, Guatemala, Honduras, Iran, Iraq, Iran, Chile, Colombia, Dominican Republic, Ecuador, El Salvador, Finland, Greece, India, Israel, Japan, Pakistan, Paraguay, Philippines, Saudi Arabia, Thailand, Venezuela and Yugoslavia.

Los Angeles Traffic Outstrips Expansion

Los Angeles' increase in air traffic at International Airport has moved at a faster pace than the city's expansion program. The Airport Commission's annual report shows that more than three million passengers used International's facilities during Fiscal 1954-55, a gain of 37.7% over the previous year, and 144% over 1947 when airline operations began at the airport.

Estimates based on population growth and increased air travel indicate the already congested International Airport will service 5 million passengers by 1960.

Meanwhile, the large passenger operation has pressed passenger terminals built more than two years ago and intended as temporary work-a-lives for a few years, pressed, according to Ralph F. Casavant, president of the Board of Airport Commissioners. Board plans to finance an expansion program reportedly have failed to obtain approval of voters.

Plans call for a self-financing bond issue at the June, 1956, primary election and, if approved, will allow construction of a passenger terminal ten times larger than the one at present use, additional runways, an airfield and control center and maintenance quarters.

Every Phase Goes

During the last year every phase of International's activity showed record gains.

Revenue from Los Angeles International Airport and the San Fernando Valley Airport for the two airports operated by the Los Angeles City De-

partment of Airports, totaled \$2,231,075 and registered a 20% gain over last year.

Major source of this revenue was the International Airport with \$1,751,349 in revenue.

Direct operating expenses of the Department of Airports, \$695,921 and depreciation amounted to \$448,918. This left a net profit of \$1,885,206, an increase of \$316,985 over 1953-54.

In addition to the 37.7% gain in passenger traffic, increases over the previous year were in freight, 15.1%, in express, 20.2%, in mail, 9.6%.

The report pointed out the expanded services at the Los Angeles airport in 1954-55. The airport's expansion at the San Fernando Valley Airport, which dropped from \$148,854 last year to \$279,345 this year due to the transfer of Lockheed flight operations to Palmdale. The sales report is being developed as a chronic and business-oriented report 1960 equivalent during the fiscal year was \$259,336 more than revenue received.

350 Flights Daily

Interesting highlights of operations at International pointed out in the report include:

• **Events:** KLM set the record, operating more than 310 daily flights to major cities throughout the world. The airlines employ 6,000 persons at an annual payroll of \$37 million. This has involved well over \$12 million in improvements of their properties on grounds leased from the airport. Airline routes, landing fees, etc., constitute one-fourth of the airport's revenue.

• **More than 110 million pounds** of air freight, express and mail were handled during 1954-55. By 1960, estimates indicate that the airport will handle 160 million pounds of air mail and express.

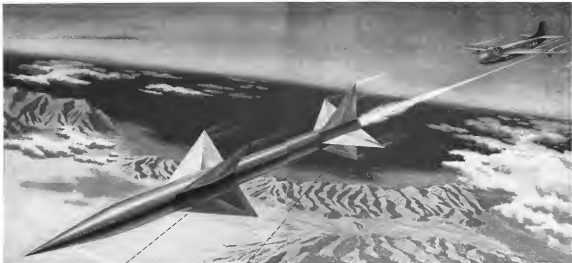
• **Airport owns approximately 3,000 acres** 1,975 of which are primarily used. The remaining 1,025 acres are mostly for available development to complete the airport by 1960.

• **Los Angeles International** has one of the best safety records in the country—no passenger fatalities in nine years of airline operation.

• **Air traffic handling** cost \$408,000 in average in Fiscal 1954-55.

Japan Buys DC-8s

Japan Air Lines has ordered four Douglas DC-8 jet transports which will be put in service on the carrier's transpacific route in early 1961. The first DC-8 is to be delivered in September 1960 to JAL and the last in March 1961. It is the second foreign DC-8 order. KLM has ordered eight.



How much machining did these Kaiser Aluminum forgings require?



The root on this air-to-air guided missile—the Sparrow—is a Kaiser Aluminum die forging, which provides maximum strength with minimum weight.

They must be accurate enough to maintain the missile's true course.

You might guess that considerable machining of the fin surfaces would be necessary. Actually no machining was done—none was necessary.

Extremely complex die parts can be forged by Kaiser Aluminum to close tolerances, and with a finish so satisfactory that costly finishing is unnecessary.

If you have a part that must be light, corrosion-resis-

ant and strong, think of Kaiser Aluminum forgings.

A Kaiser Aluminum engineer will be glad to help you at no obligation.

For complete information, contact any Kaiser Aluminum sales office listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., General Sales Office, Petroleum Bldg., Chicago 11, Illinois; Executive Office, Kaiser Bldg., Oakland 12, California.

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Joe Vito, Vice President of Eastern Co., D. D. Inc. 1489, New York Airport, New York.



Sam Gerson, President of American Aircraft Corp., 4000 Rockville, Washington, D.C., Executive, North Carolina.



Fred Green, President of the National Airline Pilots Association, 1000 N. 1st St., Miami, Florida.



John W. Hines, President of the National Airline Pilots Association, 1000 N. 1st St., Miami, Florida.



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NATION-WIDE SALES and SERVICE

ALSO DESIGN AND ENGINEERING COMPANY

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Built-In Steps for Viscount

Built-in passenger steps will be installed on a number of Vickers Viscounts in order by Capital Airlines and offered in standard equipment on aircraft scheduled for the American market. Weight penalty of the hydraulically-operated steps is 260 lb.

Cylinder Failure Blamed in Crash

Failure of an untested R2500 engine cylinder was the probable cause of the crash of an American Airlines Cessna 340 (near Fort Leonard Wood, Mo., on Aug. 4, 1955 which killed 40 persons, according to the Civil Aeronautics Board.

In an investigation of the American accident, CAB found:

• No. 12 cylinder of the right engine was not thoroughly and failed after its use after less than six hours of operation, causing a fire that the crew could not control.

• Procedures that were recommended by Pratt & Whitney, manufacturer of the R2500, and specified in American's revised manual had been completely ignored by verbal instructions approved by the carrier's engineering department and were not being followed in the carrier's inspectors in handling of cylinders.

CAB said that a laboratory study of the No. 12 cylinder in the National Bureau of Standards revealed that several fatigue cracks had passed from a single large crack. According to the history of the failed cylinder, the Board said it had been installed in October 1954 and operated for approximately 1,052 hours since eight of its hold-down studs failed. The cylinder was removed from the engine

in disassembly at the carrier's Tulsa overhaul base and returned for test and failure, according to the Board. However, it was noted, three days later the same cylinder was put back in service as the aircraft that was involved in the accident.

CAB said that company personnel testified that the practice had been to check flanges visually although American's original manual specified that the flanges of all cylinders going through overhaul be inspected for fatigue by use of a surface plate and feeler gage. It was shortly after the accident, according to the Board, that American introduced a series of changes in overhaul procedures and in personnel steps meant all pointed toward more string and supervision control of work done

CAB Orders

(PL 17)

GRANTED

American Airlines, criticized over its alleged crash, exemption of 10-day repair order for service on its Route No. 113 at Manassas, Virginia, San Juan, Guam, Cebu, Manila, and Osaka, Japan.

Capital Airlines has exemption to engage in scheduled air service between Canada and Middleton Island, Alaska.

ORDERED

Piedmont Airlines, Inc., used a permit

and certificate of public convenience and necessity for Route No. 87.

Piedmont Airlines' temporary authority to serve at request service at various points extended.

Quick Air Lines used a permanent certificate of public convenience and necessity for Route No. 117.

Quick Air Lines' temporary authority to serve at request service at various points extended.

Standard Atlantic Fuel and oil sales for its domestic operations on the route operated by the Board's short-term order for the period July 14, 1954 through Jan. 14, 1955 and for its entire service routes during the period Jan. 11, 1954 through Dec. 8, 1954.

Investigation and suspension of orders have filed by President Air Transport, Inc., applicable between Miami, Fla. and New York, Newark and Philadelphia.

APPROVED

Capital Airlines' application for authority to start service at Washington, D.C., on all flights operated under Segment 1 of Route No. 51 on Sundays and on all flights in excess of one round trip per day from New York through Chicago.

Interlocking relationships between United Air Lines and Western Shuttle. Shuttle may serve as a division of United while serving as a division of Western Shuttle Co.

Interlocking relationships between United Air Lines and Thomas P. Glass. Glass may serve as a director of United Air Lines while serving as a director of American Mail Line Inc.

DISMISSED

Investigation of proposed first class fare filed in August by B. M. Mader on behalf of Northwest Airlines as the item was not asked.

Shortlines

• **Boeing-Chicago Air Transport** has moved its London operation to the Air Line. Air Transport is in operation London, becoming the newly British independent office to use the American facilities in their London branch.

• **International Air Transport** announced a revised economic structure for the first six months of 1955: it filed \$289 million or a gain of 20% over the same period in 1954.

• **KLM Royal Dutch Airlines** has begun its interline agreement with Aerolineas de Mexico airline, for through booking between London and Mexico. The two carriers will interchange passengers at Prague.

• **Seaboard & Western Air Lines** has been approved for landing rights at Gander, Newfoundland, on its New York-German route by the Canadian Air Transport Board.



For shipping convenience around the clock—

UNITED AIR LINES makes 281 flights daily— and air freight moves on every one!

Space dependability.—Because of central payload control for cargo—is one of the big reasons why so many concerns are turning enthusiastically to United Air Lines Air Freight as an everyday tool in the profitable operation of their business.

United Air Lines' great fleet is made up of a variety of planes, ranging from giant 4-engine Constellations to jet DC-7s which provide the nation's largest high-

speed cargo bills. So no matter what you ship, or where, United can offer you air freight service tailored to meet your particular needs.

An route, too. United brings extra convenience. Only United provides one line air freight service to 51 cities, linking the East, the Midwest, all the Pacific Coast and Hawaii. Constant connections speed your shipments nationwide and world-wide.



Call the nearest United Representative
or write for free booklet, "Industry's Flying
Partner"—Cargo Sales Div., Dept. J-13,
United Air Lines, 7030 S. Cicero Avenue, Chicago.



Airline Traffic—October 1955

	Passenger Enplanings	Revenue Passenger Miles (\$100)	Revenue Passenger Load Factor	U. S. Mail Ton-Miles	Express Ton-Miles	Freight Ton-Miles	Total Revenue Ton-Miles	Per Cent Revenue Available Ton-Miles
DOMESTIC								
American Airlines	578,632	200,969	86.39	1,081,885	1,153,687	6,423,758	46,941,389	66.71
Boeing Airlines	150,150	50,000	80.54		159,405	206,412		*
Capital	329,385	70,549	80.77	354,818	253,430	361,768	1,968,227	43.90
Continental Airlines	36,690	12,715	70.13		70,115	75,890	301,793	18.65
Continental Air Lines	97,184	87,709	54.54	63,406	87,963	712,319	5,203,021	40.43
Delta Air Lines	184,133	78,947	81.89	803,850	299,155	508,817	1,781,595	38.09
Eastern Air Lines	314,996	236,675	55.69	132,448	550,439	1,315,501	59,703,450	44.66
Eastern Airlines	84,071	53,053	55.06	84,051	61,750	768,564	6,095,791	75.79
Northwest	47,780	9,531	63.35	14,691	81,285	317,514	928,510	81.70
Northwest	114,077	75,598	59.08	313,882	899,123	671,635	8,648,653	53.88
Townsend	190,176	890,387	56.72	1,091,354	984,216	2,973,984	1,631,813	81.64
United Air Lines	623,405	341,973	89.71	1,891,400	1,419,347	3,132,909	39,303,731	81.09
Western Air Lines	100,418	46,387	58.38	265,475	80,459	180,969	4,914,215	54.30
INTERNATIONAL								
American	10,569	7,570	60.71	11,486	341	895,164	1,013,807	46.83
Boeing	9,673	5,502	73.89	38,349	66,879	799,695	799,695	32.59
Continental Airlines	1,871	728	56.87	811	8,978	67,809	67,809	43.81
Continental	1,964	1,389	69.11	705	4,383	168,682	168,682	34.98
Delta Air Lines	3,362	1,640	70.85	3,741	20,496	48,619	48,619	34.59
Eastern	14,844	19,540	53.56	67,898	85,058	3,927,404	48,919	46.89
Marshall	1,368	4,480	48.81	8,579	44,665	517,065	40,899	46.89
Northwest	7,354	10,142	47.53	209,610	17,696	648,198	3,068,198	30.32
Pan American World Airways	4,807	1,790	52.47	38,497		890,623	1,736,713	52.67
Airlines	77,917	89,404	56.49	909,969	32,040	12,934,413	59,915	59.95
Public	90,809	60,504	68.58	1,095,768		1,351,810	6,914,074	47.49
Trans America	16,384	76,748	15.76	306,178	3,146,663	11,064,282	39,303	39.30
Trans America-Cross Airways	11,381	18,619	72.75	45,073	1,656,781	1,656,781	1,656,781	100.00
TWA World Airways	28,074	51,411	72.80	667,503	838,276	7,770,899	68,346	68.34
United Air Lines	7,415	16,497	77.55	17,054	94,269	9,084,083	36,645	36.64
LOCAL SERVICE								
Allegiance	33,944	5,503	48.47	6,590	28,499		353,184	47.36
Boeing	10,607	6,340	43.59	3,918	8,433	4,654	919,518	40.19
Capital	8,571	1,571	38.75	1,678	8,297	6,381	148,236	28.94
Continental	16,697	3,003	43.36	14,836	8,793	50,961	499,779	53.69
Delta Central	13,667	7,568	36.26	8,091	16,718		177,686	34.65
Midwest Airlines	30,699	5,500	32.68	4,389	8,036	8,332	546,675	59.18
North Central Airlines	48,348	6,406	32.70	16,663	34,917		468,327	47.70
Oriskany Air Lines	15,553	3,071	37.53	2,694	18,074		289,350	38.08
Piedmont	34,896	6,390	34.88	13,717	13,700	11,795	653,019	55.64
Seaside Airlines	13,083	5,599	49.76	3,440	16,506		978,345	48.18
Southern Airways	84,505	5,011	58.93		4,490	8,598		
Townsend Airways	15,444	3,899	48.99	16,350	6,136	369,364	30,336	30.33
West Coast Airlines	17,785	3,784	47.16	4,777	8,548	5,325	269,545	49.93
HAWAIIAN CARRIERS								
Hawaiian	36,060	4,465	59.31	3,540		184,472	831,498	31.37
Town Pacific Airlines	14,655	7,596	47.67	938		9,843	165,711	49.68
CARGO LINES								
American Mail Airlines						642,758	542,758	60.30
Boeing Type Line	4,795	90,686	70.85			6,545,308	8,308,071	76.86
Shuf	7,707	8,871	74.29	35,085		6,395,411	6,572,919	75.34
United Airlines						1,371,368	1,873,308	56.69
HELICOPTER								
New York Airways	8,338	47	61.84	811	1,474	408	7,070	56.45
Los Angeles Airways	576	25	38.54	3,342	1,787		6,236	36.47
Helicopter Air Service (Chicago)				3,371			8,215	40.78

* Not available.

America has homework to do!



There's probably a lot about your town that makes you want to bring a lot about it.

But there's one thing you can't be proud of. And it's a shame you claim with just about every other community in America.

The homes where for too many people live are a disgrace. Slums, semi-slums, housing blight are with you. Young them up in the homework to do.

If your town is like most in the U. S., here's what the figures show. 1 out of every 10 homes are rock-bottom slums. Nearly one-half seriously need basic repair.

But there are some things that is happening on the other side of town, you may say. The problem isn't mine.

Slums are YOUR homework

Distance is no barrier against the threat and cost of housing blight.

Your town go up because it takes more money for year town to fight the diseases and delinquency and poverty spawned in the slums. The security of your family goes down because the slums are the nearest part in of contact.

Where your business comes in

Every firm has a responsibility toward the town where it's located. Part of it is to support community improvement as any other good citizen would.

Some slums are beyond repair. They must be razed

and a fresh start made. Others can be made to conform to accepted living standards. So it is up to you to get behind every sound program which seeks to provide adequate housing for all our people.

Once and individual groups must have business backing — your firm's backing if they are to succeed.

Follow the course of Action!

A group of Americans from every walk of life has joined together in a non-profit organization to combat blight and community deterioration, A. C. T. I. O. N., the American Council To Improve Our Neighborhoods.

Send today for a free copy of "ACTION." It explains what ACTION is and proposes to do. It lists local, state, national, and other material which can help you. Address: P. O. Box 506, Radio City Station, New York 30, N. Y.



American Council To Improve Our Neighborhoods

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One Step Toward Better Air Traffic Control

The major issue at stake in replacement of Frederick B. Lee as head of the Civil Aeronautics Administration by his deputy administrator, Charles J. Lowen, Jr., is the future of air traffic control.

For more than six months CAA has been the focal point of a rapidly growing crisis in air traffic control. During this period CAA has been the target for a rising volume of bitter criticism on this score by airline pilots, airline management and the military. It is the airlines, corporations, Air Force and Navy that do the vast bulk of Federal money flying in instrument weather when the air traffic pro gets tightest and most dangerous.

Aviation Week started last August:

"A much more vigorous approach to the air traffic control problem is necessary now if aviation is to avoid the tragic consequences of more mid-air collisions, economic strangulation of airline revenue and blighted efficiency of Strategic Air Command and Air Defense Command operations."

Gen. Curtis LeMay, commander of Strategic Air Command, angrily threatened to push for military control of the aviation system unless it was reorganized to meet current and future military needs. Lt. Gen. Joseph Smith, commander of the Military Air Transport Service, publicly attacked the Federal aviation and traffic control system as antiquated. Gen. Smith's public blast was delivered before the Washington meeting of the Radio Technical Commission for Aeronautics, whose members are experts on the aviation problem. Comments of airline pilots and operations executives working within the present traffic control framework are for the most part acceptable. Air traffic control problems have been the theme of more than one recent meeting of top level airline management, and the Air Transport Association has been deeply concerned.

Pressured Into Action

Last summer, CAA under Lee's leadership fought a bitter campaign against integrating Air Defense under into a common traffic control system. Only heavy pressure from other agencies forced CAA into the Deer Island (Boston) experiment that will eventually lead to all military aircraft, including B-47's and B-52's, CAA's most sacred bird-airways integration plan has been rejected by the Air Coordinating Committee's New panel as "too little, too late."

Disney over the CAA strike, Under Secretary of Commerce Louis Rothchild brought in Lowen, first as a special consultant last May and then as deputy CAA administrator in August.

Lowen, like Lee, is a pilot and a Republican. He served with the Air Transport Command in World War II, then went with Capital Airlines after the war and later managed the municipal airport at Denver. One of Lowen's first conclusions at CAA was that air traffic control was its most critical problem and a fresh and more vigorous approach to solving this problem was un-

profit required. He drafted a plan of action including establishment of an air traffic control operation separate from the traditional CAA Office of Federal Airways. Lowen also wanted to recruit fresh traffic control talent to operate the new group. Lee vigorously opposed Lowen's air traffic control proposals.

New Approach

On Oct. 10, just after Gen. Smith's entrance, Aviation Week again warned:

"If CAA does not take necessary action immediately (on air traffic control), Congress will have to designate some other agency to solve the problem."

Under Secretary Rothchild did not wait for the possibility of congressional pressure. Stirred by reaction from airline management and the military, he took what he considered the necessary action at CAA. With the President's approval he fired Lee and replaced him with Lowen. This action was a clear endorsement of a new and more vigorous approach by CAA to the air traffic control problem.

Lowen and top level Commerce Department officials are firmly committed to a program of improved traffic control. It will indeed be surprising if an independent traffic control group is not established soon in CAA, headed by top notch experts in the field. It is likely that Lowen in picking a deputy will get a man who has practical experience in air traffic control problems both as a pilot and in the homeostatic maze of Washington.

Lowen's Problems

Lowen will find, like other CAA administrators who have preceded him, that his biggest roadblocks to making progress are likely to arise within his own organization where an entrenched bureaucracy has been dumbfounding obstacles to the vast technical changes that have appeared aviation. There are good many capable people in CAA. One of Lowen's toughest tasks will be to find them and weld them into a solid, technically competent team that is firmly dedicated to solving, not ducking off, aviation's control problems.

Lowen also will find widespread external support for a vigorous and tactically sound attack on the problems of air traffic control.

The aerial is being out at Seattle, Santa Monica and Burbank on a great list of jet transports. The airlines are placing billions of dollars in orders for these planes in the expectation that they will be able to carry the American public in these safely and swiftly by 1960.

Unless the Civil Aeronautics Administration takes the lead now in building a Federal aviation and air traffic control system that can handle these jet transports, American aviation will drift steadily toward the worst crisis in its history.

—Robert Hôte



"CITY OF MERCED" CREW WINS SAC COMPETITION

B-47 Team Pinpoints Sacramento "Target"

THE STORY BEHIND THE STORY:

- It made September headlines when a most important "Secret" was won by a three-man team in a B-47 bomber and its precision electronic equipment. The "Secret" in this case was the annual competition to test the effectiveness of bombing and navigation by our Strategic Air Command. Top flight crews from SAC bases each flew 5000 miles on simulated missions circumventing the extreme secrecy of our strategic bombers.
- Piling up more points than any other team in the contest, the crew of the "City of Merced" earned the title of "the world's deadliest bomber crew."
- On one of their runs the target was the northeast corner of an industrial plant in Sacramento, flying nearly seven miles above the earth and at a speed of nearly 500 miles an hour the "City of Merced" dropped its "bomb" within a dozen's throw of the designated target.
- Working all the way for the Navigator Bombardier Officer was the K Bombing Navigation System. This system developed for the Air Force by Sperry, Inc. guided the target by radar. With the Officer keeping the nose hairs directly over the target on the radar scope, the K

System systemically navigated, flew the plane, compensated for the effects of speed, altitude and wind on the "bomb" to be dropped, and then released the "bomb" at the exact instant required to insure the direct hit.

- And a rigid competition is dramatic proof of what the Air Force is doing to discourage possible aggression—by making certain an aggressor nation will be hit surely and easily should it take belated notice. And this is a building and navigation system is another example of Sperry's ability to produce equipment which helps insure the success of military missions.

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Inside look at a safe overhaul!

NOW resilient Nylon inserts guarantee even better performance and extra reusability
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ELASTIC STOP® nuts are specified for their proven self-locking, vibration-proof characteristics. But—air frames must also be designed with simple disassembly and economical overhaul in mind. And fixed fasteners must provide a safe margin of locking torque even though re-used again and again. Nylon inserts won't wear out. Bolt threads enter smoothly into the plastic locking collar, guaranteeing the narrow range of torque "scatter" ideal for power-tooled assembly lines. And for re-assembly any AN quality bolt can be used interchangeably . . . safely . . . when ESNA nylon inserts are on the "blind" fastener. The result . . . safer, simpler, low-cost maintenance procedures.

Nylon insert Elastic Stop nuts also provide:

- immediate identification during production or in the field.
- positive thread sealing and vibration-proof resistance to loosening.
- non-galling locking action that protects bolt threads against stripping and seizure.
- inertness to most common organic chemicals, oils, fuels and fungus growths.
- locking device adaptability to special aircraft fastener design requirements and productivity through a wide size range from 0-80 to over 2".

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